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Division Of Solid & Hazardous Waste
Utah Dept-of Environmental Quality

VATC

ASSOCIATES INC.

SOLITUDE LANDFILL
CLASS V LANDFILL APPLICATION

MUNICIPAL SOLID WASTE DISPOSAL

GREEN RIVER, UTAH

AUGUST 2002

CLASS V LANDFILL APPLICATION

Prepared for

Green River Landfill, LLC
A Utah Limited Liability Company

Prepared by

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2681 Parley's Way, Suite 106
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February 13, 2002

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SECTION ONE: GENERAL INFORMATION

1.0 GENERAL INFORMATION

Landfill Investors, LLC proposes to permit a Class V commercial solid waste landfill, the "Solitude Landfill", within Green River, Utah, in Grand County, Utah. The landfill will be used for disposal of municipal solid waste and will be solely under contract to the Utah municipalities that it serves. It is intended that the landfill will be operated in accordance with all Federal and State laws and regulations applicable to the management and operation of landfill sites. This includes, but is not limited to, the Rules of the Utah Solid Waste Disposal Act and Subtitle D of the Resource Conservation and Recovery Act.

1.1 NAME OF FACILITY

Solitude Landfill

1.2 SITE LOCATION

The landfill property is an irregularly shaped 320 acre parcel in Section 22, Township 21 South, Range 17 East, Salt Lake Base and Meridian (see Figure 1). The site is located approximately nine miles east of the Green River in the City of Green River. The latitude and longitude coordinates of the entry gate are :

Latitude:	N 38° 58' 20"
Longitude:	W 110° 1' 42"

1.3 FACILITY OWNER

Green River Landfill, LLC
4570 Westgrove Drive, Suite 240
Addison, Texas 75001
972-407-0550

1.4 FACILITY OPERATOR

Landfill Investors, LLC
4570 Westgrove Drive, Suite 240
Addison, TX 75001
(972) 407-0701

1.5 LOCAL CONTACT PERSON

Pete Fote
2825 East Cottonwood Parkway, Suite 500
Salt Lake City, UT 84121
801-990-2345

1.6 TYPE OF FACILITY

Class V Commercial Landfill

1.7 TYPE OF APPLICATION

Initial Application

1.8 PROPERTY OWNERSHIP

Green River Landfill, LLC, a Utah Limited Liability Corporation, owns the property; proof of ownership is included in Appendix A.

1.9 CERTIFICATION OF SUBMITTED INFORMATION

The Owner's and Operator's certifications of submitted information is included below:

CERTIFICATION OF SUBMITTED INFORMATION

[signature], Pres
(Representative of Green River Landfill, LLC, Owner) (Title)

[signature], PRESIDENT
(Representative of Landfill Investors LLC, Operator) (Title)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: [signature], Date Aug 23-02
Representing Owner

Signature: [signature], Date Aug. 23 - 2002
Representing Operator

SUBSCRIBED AND SWORN to before this 23rd day of August, 2002

My commission expires on the 5th day of February, 2005.

Roxie Hebert
Notary Public in and for

(SEAL) Dallas County, Texas
(State)

ROXIE HEBERT
Notary Public, State of Texas
My Commission Expires
February 05, 2005

SECTION TWO INTRODUCTION

2.1 PROJECT SUMMARY

Green River Landfill, LLC (Owner), a Utah Limited Liability Corporation, and Landfill Investors, LLC (Operator) are a partnership of commercial landfill development firms with local offices in Salt Lake City, Utah. The Owner and Operator are making this application for the purpose of disposing of municipal solid waste, and will operate the landfill solely under contract to the municipalities that it serves. The site for the new Class V Municipal Sold Waste (MSW) landfill is approximately nine miles east of the Green River in the City of Green River. The landfill will accept only MSW waste delivered by truck and/or rail from municipal clients; no waste will be accepted for disposal from municipalities outside Utah or from sources not under contract with Landfill Investors.

2.2 GENERAL DESCRIPTION OF THE FACILITY

The Solitude Landfill (Landfill) will be located on 320 acres of privately owned land located in Section 22, Township 21 South, Range 17 East, Salt Lake Base and Meridian. It is bordered on all sides by undeveloped land. Figure 1 shows the location of the site. Proof of ownership is included in Appendix A. Within the site boundaries are located three disposal cells and associated access roads.

The land use zoning of the site and the properties adjacent to the Landfill boundary is designated Industrial. The Landfill site will be surrounded by a chain-link security fence, phased in place as each cell is constructed. Other fencing may be placed between cells, as may be appropriate to or directed by various municipal clients. Access to the landfill will be gated to prevent unauthorized entrance when the landfill operator is not present. The locked gate will be located approximately 800 feet south of the northwest property corner. Entrance to the Landfill will be from the west along an improved all-weather road.

2.3 LEGAL DESCRIPTION OF FACILITY

The property was surveyed in June 1994 and the topography was mapped. The topographic map is provided here as Figure 2, Site Map.

2.4 TYPES OF WASTE AND AREA SERVED

The Landfill will accept only MSW waste from Utah municipalities under contract with the Owner / Operator. This waste will be delivered to the Landfill by truck and/or rail. The potential area served is the State of Utah. No hazardous waste will be accepted (see Section 3).

3.0. PLAN OF OPERATION

The purpose of the Plan of Operation is to provide an accurate description of the daily operation of the Landfill.

3.1 SCHEDULE OF CONSTRUCTION

The Owner will begin construction within 60 days following 1) approval by the Utah Department of Environmental Quality to operate the Landfill, 2) approval by the City of Green River to operate the Landfill, and 3) completion of a disposal contract with one or more Utah municipalities. Table 1 presents the proposed schedule of general site construction, and construction of the first cell; however, rail access will be not be constructed until such time as the volume of waste makes it feasible or the demand of contracted municipalities requires it.

Table 1
Schedule of Construction

Start Date	Construction Activity	Completion Date
Notice + 60 days	Stake Disposal Cells for Excavation	Notice + 70 days
Notice + 72 days	Excavate First Disposal Cell & Stockpile Dirt	Notice + 102 days
Notice + 72 days	Grade and surface access road to site	Notice + 93 days
Notice + 102 days	Construct 1000 sf Operations Building	Notice + 144 days
Notice + 102 days	Fence & Gate Property	Notice + 137 days
Notice + 147 days	Facility Open for Disposal Operations	NA

Notice = Notice of Approvals and Contract Completion

The Landfill will be constructed with three disposal cells. One, two or all three cells may be constructed at once, depending on contractual arrangements with municipal clients. For example, two municipalities may allow co-mingling of their waste in one cell, while a third may demand a separate cell. Additionally, while it is intended to operate the Landfill as a bale-fill, a municipality that does not utilize baling technology will need a separate cell. The result of this potential variability is that the Schedule of Construction may be modified.

3.2 DESCRIPTION OF ON-SITE WASTE HANDLING PROCEDURES

The Landfill will be operated by Landfill Investors, LLC. Management of the Landfill will be conducted out of the operations office at the Landfill. The local contact at the site will be designated by the Owner's Utah Manager, Pete Fote. Daily operation of the landfill will be under the direction of his designated Landfill Operator (Operator) on site.

The MSW Landfill design will incorporate an excavated cut-and-fill method, excavating three disposal areas below the natural ground surface to an approximate maximum depth of between 30 to 35 feet (see Drawings 6 and 7). The bottom will be graded at approximately 2 percent slope, south to north, to follow the general topography of ground surface. The below-grade disposal area will be excavated and constructed prior to acceptance of waste. Disposal of MSW will continue until the entire area has been filled to ground surface, then from ground surface up to a height of approximately 35 feet.

The gate to the landfill will be kept locked at all times that the landfill is not in operation. It is the responsibility of the operator to unlock the gate each morning and lock the gate at the end of the day. The operator is responsible for directing vehicles to the proper location for disposal of waste. Direction of vehicles also may be accomplished through the placement of directional signs. An operator will attend the landfill at all times that the landfill is open.

3.2.1 Bale-Fill Operation.

The Operator will direct trucks with bales to the working face of the landfill cell designated for bales, where he will direct unloading and placement of the bales. Bales will be placed in such a manner as to reduce or eliminate air space between bales and to create the effect of an interlocking wall of bales. The number of bales accepted for disposal will be maintained on a daily basis. The Operator will take a photograph of the bale-fill working face at the end of each working day and prior to placement of required daily cover.

A Daily Operating Record form shall be completed during each day of operation at the landfill. An example of the Daily Operating Record is included in Appendix B. For the bale-fill cell, information shall include number and type/size of bales, inspection log, and any deviations from the approved Plan of Operation, along with the reason for the deviation. Completed forms shall be kept on file at the site.

3.2.2 Compacted Fill Operation

Non-baled waste may be delivered to the Landfill by either truck or rail car. In either event, the vehicles will be unloaded at the site and the waste moved to the working face of the compacted fill disposal cell. The operator will perform load counts on a daily basis, making a record of the number, type, maximum volume and tare weight of each delivery vehicle arriving at the site. A Daily Operating Record form shall be completed during each day of operation at the landfill. An example of the Daily Operating Record is included in Appendix B. Information shall include accurate load counts, type of waste, inspection log, and any deviations from the approved Plan of Operation, along with the reason for the deviation. Completed forms shall be kept on file at the site.

Incoming MSW will be deposited at the working face under the direction of the operator. Refuse will be compacted across the working face with a compactor to achieve maximum practicable in-place density. The working goal for in-place density will be the range of 1100 to 1400 pounds per cubic yard. In-place density will be determined by calculation using disposal records (weight and volume) and a topographic survey. Density calculation will be performed on an annual basis so that the information will be complete in time for the annual report to the DEQ.

The working face of the Compacted Fill disposal cell will be covered daily with a minimum of six inches of soil over the surface of all exposed waste.

3.3 INSPECTIONS AND MONITORING

The schedule for inspections and monitoring of landfill facilities to ensure proper operation and maintenance is provided in Table 2.

TABLE 2
INSPECTION AND MONITORING SCHEDULE

Inspection/Monitoring Activity	Frequency
Access road and gate	Monthly
Fence inspection	Monthly
Landfill equipment maintenance	Per manufacturers recommendations
Closure final cover inspection	During closure activities
Post Closure Inspection/Maintenance	Quarterly
Post Closure Monitoring	Quarterly

There is no installed equipment at the landfill such as monitoring wells, leachate collection or gas collection systems, therefore there is no required maintenance as specified in UAC R315-302-2(2)(h).

3.4 CONTINGENCY PLANS FOR FIRE OR EXPLOSION

As a precaution to avoid a fire hazard, all waste shall be covered with soil on a daily basis (Section 3.2). In the event that fires do occur during operating hours, the burning material will be separated from other material and covered with soil, using on-site earth-moving equipment.

Small fires may be extinguished with the fire extinguishers provided in the site vehicles or by using on-site water, available from the water storage tank and/or the water trailer. Upon notification of an on-site fire which is not controllable with on-site fire protection equipment, a long blast (greater than 30 seconds) on a vehicle horn will be sounded, and nonessential equipment will be shut down. All site personnel will assemble outside the landfill entrance, the Green River City Fire Department will be alerted and all personnel will move to a safe distance from the involved area until the fire is extinguished. The telephone number and location of the nearest fire station will be displayed in the site office and in all site vehicles.

Fires that occur during times that the landfill is closed will be more difficult to control due to the time available for the fire to spread. If a fire is reported after hours, the Operator or Landfill Manager may utilize site equipment to segregate the burning portion and bury the fire with soil. Otherwise, the local fire department will be summoned to control the fire.

The contingency plan for dealing with explosive gasses is provided in Section 3.6.1. Such gases, however, are not expected to be generated within this Class V landfill due to the dry nature of the waste and the extremely limited availability of moisture to be entrained within the landfilled waste.

3.5 CORRECTIVE ACTION PROGRAMS FOR GROUNDWATER CONTAMINATION

Groundwater monitoring will not be performed at the Solitude Landfill, therefore no corrective action programs are included with this application.

3.6 CONTINGENCY PLANS FOR OTHER RELEASES

3.6.1 Explosive Gas

Due to the types of waste received and the dry climate of Utah, this landfill should generate little, if any, explosive gas. If quarterly gas monitoring indicates that methane gas exceeds the LEL at the property boundary, however, corrective measures will be implemented within ten (10) days. The contingency plan for implementing corrective measures will include 1) notification to Green River City and DEQ, 2) increasing quarterly monitoring frequency to monthly, and 3) installation of a passive venting system.

3.6.2 Run-Off Control System

During operation of the below-grade disposal operations, there will be no potential for failure of the run-off control system. During operation of the above-grade disposal operations, however, the perimeter berms that constitute the run-off control system could be compromised by such incidents as an excessively heavy rainfall or accidental breach by equipment. The contingency plan for dealing with such failure is first to re-direct surface flow (if any) back into the perimeter, and second to reconstruct the berm sufficiently to function as designed. All aspects of this contingency plan can and will be implemented using on-site equipment.

3.7 FUGITIVE DUST

Fugitive dust is not expected to be a nuisance; there are no residences within one-half mile of the facility. If, at any point in the operation of the facility, fugitive dust is determined to be a problem, measures will be taken to control it, which may include watering the road. Fugitive dust will be addressed routinely as necessary to comply with Division of Air Quality regulations.

3.8 MAINTENANCE OF INSTALLED EQUIPMENT

No equipment is installed, or is planned to be installed, at the Landfill, including groundwater monitoring equipment, leachate collection equipment, and gas collection and monitoring equipment.

3.9 PROCEDURES FOR EXCLUDING HAZARDOUS WASTE

The landfill will only accept MSW from municipalities under contract with the Owner. By contractual agreement, waste delivered to the Solitude Landfill that has originated from a Transfer Station will be required to design and implement procedures for excluding hazardous waste. These procedures will include, at a minimum, formal training of Transfer Station operators and / or collection personnel in the identification and removal of hazardous waste and hazardous materials. The landfill will not accept any hazardous waste, not even conditionally exempt small quantity generator hazardous waste.

Although procedures initiated at the respective Transfer Stations should preclude the delivery of hazardous waste to the Landfill, the Landfill Operator will also be responsible for identification and prohibition of unacceptable wastes that may be discovered in unbaled

waste or loose waste delivered by a local or regional municipality that does not have access to a Transfer Station. Loads will be inspected as they arrive and any suspicious waste will be refused access to the landfill. The dozer operator also will become aware of unacceptable waste in any waste material as he is working and compacting the load. Any suspicious waste discovered on the working face will be segregated from the other waste pending alternative disposal. The Landfill Manager will have the ultimate authority and responsibility for decisions regarding acceptance or rejection of any waste.

3.10 PROCEDURES FOR CONTROLLING VECTORS

The waste accepted at the Solitude Landfill will be either baled or loose. In either event, the waste will originate from a Transfer Station and as a result will be relatively dry. This type of waste does not lend itself to attracting or generating disease vectors; however, all waste shall be covered on a daily basis to prevent scattering of waste or attracting disease vectors. Standing water shall be allowed to drain to the extent possible to preclude the harboring of mosquito larvae.

3.11 PLAN FOR ALTERNATIVE WASTE HANDLING

If a portion of the site must be closed due to emergency or extreme weather conditions, or becomes otherwise inaccessible, another area of the site may be designated to receive waste materials on a temporary basis. In this event, only areas inside constructed disposal cells will be used. If on-site roads become impassable, or other conditions arise which preclude continued operation, the Landfill Manager may elect to close the Site temporarily.

3.12 GENERAL TRAINING AND SAFETY PLAN

Each employee who works with solid waste at the Landfill will be trained and have a working knowledge of basic maintenance and operational techniques necessary to operate and maintain the facility in a manner which does not endanger human health and safety or environmental quality, including emergency response and contingency plan implementation. Training will be accomplished through both on-the-job training and classroom training sessions (e.g. SWANA training classes).

The facility training program will be directed by the Landfill Manager, or a designated professional trainer. Initial training will be completed within two months of employment followed by an annual review of basic waste management skills or formal annual training.

3.13 RECYCLING

Recycling activities will be performed by the contracted municipalities prior to any waste being delivered to the Landfill. No provisions for recycling will be made at the landfill and the general public will not have access to the landfill.

3.14 COMMERCIAL DISPOSAL FACILITY REQUIREMENTS, R315-310-3(2)

The Solitude Landfill will be operated solely under contract to one or more local Utah governments ("municipalities") to dispose of non-hazardous waste generated within the borders of those municipalities. Therefore, the Solitude Landfill is not subject to the requirements of R315-310-3(2)(a) and (b).

4.0 GEOHYDROLOGICAL REPORT

The site is particularly suited for a landfill due to its remote location, relatively small amount of annual precipitation (6.5 inches), relatively high evapotranspiration (55.9 inches), low-permeable bedrock immediately below the site, the considerable depth to groundwater and the relatively poor quality groundwater. The site, and the area surrounding the site, is not used for agriculture due to the lack of water and the poor soil and vegetative conditions.

The site conforms to the following location standards set forth in R315-302-1 (2):

- The site is not located within one thousand feet of any national, state, or county park, monument, or recreation area; designated wilderness or wilderness study area; or wild and scenic river area; ecologically and scientifically significant natural areas; or farmland which is classified as "prime," "unique," or of "statewide importance."
- No permanent dwellings or historic structures or properties exist within one-forth mile of the site.
- The site is not located within five miles of any airport runway.
- No archeological sites are nearby.
- The site is not located in a subsidence area, a dam failure flood area, above an underground mine, or above a salt dome or salt bed.
- The site is not located within 200 feet of a Holocene fault, nor is it located within a seismic impact zone.
- The local geology of the site, confirmed by field study, does not indicate that it is an unstable area subject to differential settling.
- The site is not located in any public land used by a public water system for water shed control for municipal drinking water purposes, or in a location that could cause contamination to a lake, reservoir, or pond.
- The site is not located in a flood plain or wetland area.
- Based on hydrogeologic studies in the area, the aquifer below the site is 200 to over 1000 feet below the surface. Although some isolated perched water pockets 25 to 40 feet below the surface were found along the ephemeral streams, the water quality of this water was found to be contain generally greater than 10,000 mg/L TDS.

4.1 LOCAL GEOLOGY

The proposed landfill site lies on a gently northwest-sloping pediment that has developed on the Mancos Shale (see Figure 2, Geologic Map, and Figure 3, Geologic Cross Section). The site is typical of Badlands topography and is dissected with arroyos and ephemeral streams. Brown's Wash, a large ephemeral stream, crosses the northern portion of the site flowing west. A tributary of Brown's Wash also crosses the site flowing in a northwest direction and joins Brown's Wash outside of the West boundary of site. Brown's Wash flows into the Green River approximately 6 miles west of the site. Ground elevations at the site range from approximately 4300 to 4400 feet above mean sea level; the Green River, located six miles west of the site, is at about 4050 feet above sea level. The south edge of the site is bounded by low barren hills. The eroded flank of the East Tavuputs Plateau (Book Cliffs) is about 5 miles to the north and east of the site.

The climate of the site is semi-arid and generally has little vegetation, consisting of clumps of shadscale, occasional salt grasses, and isolated cactus plants (Hepwirth, 1963).

4.1.1 Stratigraphy

Soil cover over the site is generally very thin and consists of either a thin layer of alluvium or weathered shale. The northern and some of the central portions of the site are covered with alluvium and/or terrace deposits from the ephemeral stream channels in those areas (see Figure 2). Generally, alluvial deposits are near the base of the plateaus and near the larger stream channels where they contain a wide range of grain sizes, varying from boulders to clay. Subsurface logs from test pits and drill holes from the site show that the depth of alluvium generally ranges from 0 to 22 feet with the thicker depths near the stream channels. The remaining areas of the site are covered with an overburden that consists of silty clay material, weathered from the Mancos Shale bedrock. Test pits and borings indicate that the depths of silty clay overburden ranges from 0 to 5 feet. Test pit and drill hole logs are presented in Attachment 1.

Bedrock at the site consists of outcrops of the Mancos Shale formation which is a dark-gray marine shale. Drilling logs from water and oil wells in the vicinity indicate that the Mancos Shale has a minimum thickness of about 1100 feet in the area of the site. Projecting the dip angle of the lower contact of the Mancos outcropping southwest of the site (see Figure 2, Geologic Map), the shale would be approximately 1420 feet thick below the site. The Mancos Shale formation has two distinguishable members in the lower part of the section in the area of the site. In descending order these are the Ferron Sandstone and Tununk Shale. These both outcrop approximately 2 miles southwest of the site. Projecting the dip angle of these beds indicates that the Ferron Sandstone would be approximately 1300 feet below the site.

Directly below the Mancos Shale formation lies the Dakota Sandstone with a maximum thickness of 200 feet. The Dakota Sandstone comprises the top layer of the Mesozoic Sandstone Aquifer, an aquifer composed of a thick sequence of 11 bedrock units that are mostly sandstones. The maximum thickness of the Mesozoic Sandstone Aquifer is about 3000 feet. Underlying the Mesozoic Aquifer is the Lower Mesozoic and Upper Paleozoic confining beds which are comprised of interbedded layers of siltstone, shale, sandstone and a highly impermeable layer of evaporites with a maximum thickness of 12,000 feet. Under the confining beds is the Lower Paleozoic Aquifer which is comprised of siltstones, sandstones, and limestones. A conceptual geologic cross section has been prepared as Figure 3 and shows a profile of general subsurface conditions

4.1.2 Structural Geology

A site investigation performed in 1994 included coring into the Mancos Shale to characterize the bedrock. The bedrock was determined to be highly weathered in the top 0 to 10 feet of the shale, rapidly grading to a competent shale to the maximum depth of the coring (140 feet). The Rock Quality Designation (RQD) of the bedrock ranged from 0 near the surface to 100% at about 30 feet deep and deeper. Joint spacing ranged from 0-1 inches near the surface to over 5 feet at the bottom of the corings. Some vertical fracturing was observed in

the upper 20 feet of the corings, but at depths over 20 feet the joints were relatively clean and largely horizontal with some evaporite material (gypsum) found along the joints.

The nearest Holocene fault, the Little Grand Fault is located 1¼ miles south of the site. The Little Grand Fault runs generally east-west and is a normal fault that is approximately 12 miles in length (Rush, 1982). Although some smaller faults are located approximately 5 miles to the east and about 3 miles to the southwest, seismic activity at the site is probably governed by the larger and closer Little Grand Fault. Seismic activity at the site is considered minimal based on USGS National Seismic Hazard Mapping Project (http://geohazards.cr.usgs.gov/eq/index.html). According to the probabilistic ground motion values given for the site's coordinates, there is a 90% probability of not exceeding a horizontal acceleration of 0.05 g in 50 years.

4.2 REGIONAL GEOLOGY

The proposed facility is located in the northern portion of the Paradox Basin which is in the Canyonlands section of the Colorado Plateau. The region is characterized by young-to-mature plateaus and large topographic relief. Paradox basin is not a definable physiographic feature but consists of the portion of the Colorado Plateau that is underlain by a thick sequence of evaporite (salt) beds.

Rock units in the area dip gently to the northwest. Identifiable rock outcroppings in the region include the Mesaverde Group, which is a sandstone unit with seams of shale and coal; the Book Cliffs and higher elevation plateaus are formed from Mesaverde Group. Below the Mesaverde Group lies the Mancos Shale formation which is a dark-grey marine shale; the proposed site lies on an outcropping of the Mancos Shale Formation. Beneath the Mancos Shale formation lies the Dakota Sandstone which comprises the top layer of the Mesozoic Sandstone Aquifer, an aquifer composed of a thick sequence of 11 rock units that are mostly sandstones. The Dakota Sandstone outcrops about six miles south of the site. Further south of the site is a large outcropping of the Lower Mesozoic confining beds which consists of interbedded layers of siltstone, shale, sandstone, and evaporite beds. The Canyonlands area, approximately 30 miles south of the site, is formed from the Lower Mesozoic Confining beds. Under the confining beds is the Lower Paleozoic Aquifer which is comprised of siltstones, sandstones, and limestones.

4.3 GROUNDWATER

Based on drill holes from the surrounding area, the groundwater is at significant depths and is of generally low quality. Groundwater flow is generally to the west-southwest from areas of recharge (Book Cliffs) toward areas of discharge (Green River). Analysis of wells drilled in the area indicated minimum depth of water is 200 feet and maximum is over 1,000 feet.

Groundwater in the area occurs primarily in two separate aquifers: the upper Mesozoic sandstone aquifer and the lower Paleozoic aquifer. The upper and lower aquifers are hydraulically separated by thick beds of evaporates which effectively delineates the two aquifers and cause the aquifers to act independently. All ground water recharge to the aquifer system from the ground surface is limited to the upper aquifer, as the lower system is hydraulically isolated from the surface. Potential leakage between the aquifers is in an upward direction under the site (Rush, 1982).

4.3.1 Upper Aquifer Characteristics

The upper Mesozoic aquifer consists of a thick sequence of 11 northwesterly-dipping rock units that are mostly sandstones. The aquifer has a maximum thickness of 3,000 feet and is confined in the area of the site by the impermeable Mancos shale formation. Generally, water occurs in the rocks of the unsaturated part of the upper ground water system as a result of recharge from local precipitation. The precipitation vertically percolates downward toward the underlying zone of saturation where it begins to move horizontally. Regionally much of the upper aquifer is unsaturated, although perched water is common.

Water in the upper aquifer is generally found at depths greater than 200 feet. The potentiometric surface of the upper aquifer is the lowest near the Green River and rises away from the river: the elevation of the potentiometric surface is at least 200 feet below the ground surface of the site according to a potentiometric map developed by Rush (1982).

4.3.2 Upper Aquifer Recharge

Recharge from precipitation in the area of the site is probably minimal due to the outcropping of the impermeable Mancos Shale at the site. The majority of recharge to the upper aquifer system is greatest near the Book Cliffs, where the precipitation is relatively large, and along the ephemeral streams, where infiltration is most likely (Rush, 1982).

No recharge to the upper aquifer occurs due to inflows from the Green River. The potentiometric maps of the aquifer suggest instead that the river acts as a drain for the area. Recharge to the upper aquifer also occurs from subsurface inflows from the adjacent areas. Potentiometric maps of the area indicate that most of the ground water inflow is from the San Raphael Swell to the west and the Book Cliff area to the north and east (Rush, 1982).

4.3.3 Upper Aquifer Outflows

Groundwater in the upper aquifer is too deep to be subject to evapotranspiration although the shale forms soils with minimal permeability and large porosity that retains temporarily stored water near the ground surface. Here it is easily discharged from perched water areas by transpiration due to plants and evaporation from the soil. Most of the evapotranspiration occurs along the larger ephemeral streams where there is perched water.

Several studies have been performed to determine the amount of outflow from the upper aquifer system into the Green River. Potentiometric maps and mass balance equations for the Green River indicate that regionally, there is flow from the upper aquifer into the Green River, although there appears to be very little local subsurface flow from the area based on potentiometric maps of the region. Regionally, subsurface flow from the area appears to flow from the area near the Green and Colorado River confluence to the south of the site. Discharge from wells and springs is believed to be minimal as there are no large diameter wells in the vicinity of the site, and there are few springs, and these springs generally flow from the perched water table (Rush, 1982)

4.3.4 Perched Water

During the 1994 field investigation, perched water was initially found in four locations at the site, in exploratory drill holes and monitor wells DH-2, MW-2, MW-5, MW-7 and DH-10.

MW-7 was later discovered to be dry after completion of the monitor well. The only drill holes that produced perched water are found near the ephemeral streams. The perched water is believed to be isolated pockets of water that have been recharged from runoff from the ephemeral channels and does not extend across the site.

4.4 WELL INVENTORY

A search of water rights on file with the Utah Division of Water Rights indicated that no wells were located within 5 miles of the site (Appendix C).

4.5 WATER RIGHTS

The only water rights within a radius of 5 miles of the site include seven livestock watering ponds, five springs, and eight diversions along the ephemeral streams in the area. The City of Green River procures potable water from the Green River and does not utilize wells because of the significant depth to, and poor quality of, the ground water.

4.6 SURFACE WATER

Two large streams, the Colorado and Green Rivers, flow through the region in a southerly direction. The Colorado River is located approximately 45 miles east of the site and the Green River is located about 6 miles west of the proposed site. Two smaller perennial streams, the Price and San Rafael Rivers, enter the Green River from the northwest at a distance of 12 miles north and 16 miles south of the site, respectively. Most of the drainages in the area have ephemeral streams that flow in response to snowmelt or runoff from precipitation events.

4.7 WATER QUALITY

Existing data from Rush (1982) indicate that the ground water from the upper confining bed (Mancos Shale) and the upper aquifer (Mesozoic Sandstone) is brackish with dissolved solids levels from 500 to 14,000 mg/l. This would classify the water as Class II (drinking water) to Class IV (saline ground water) according to the *Administrative Rules For Ground Water Quality Protection*, (DWQ, 1993).

Perched water samples were obtained on July 29, 1994 from DH-2, DH-10, MW-2 and MW-5. Laboratory results, which are provided in Appendix D, indicate that the quality of the perched water below the site is of poor quality with TDS values ranging from 9,400 to 30,000 mg/l. These TDS values would generally classify the perched water as Class IV (Saline Groundwater), for TDS above 10,000 mg/l. This is based on the groundwater aquifer classification system established in the Utah Groundwater Quality Protection Regulations.

4.8 CALCULATION OF SITE WATER BALANCE

The site is semi-arid with annual precipitation at the site estimated to average 6.5 inches a year (*Utah Climate*, 1992). Annual evapotranspiration is significantly higher (55.9 inches) than the average precipitation at the Site. The site is characterized by a thin layer of soil that overlies the Mancos Shale bedrock. The soil consists of permeable silty gravel alluvium near the larger ephemeral streams with a thinner layer of silty clay soils over the rest of the site.

The upper ten feet of bedrock is highly weathered and permeable but grades rapidly to a

non-weathered impermeable shale (permeability values range from 10^{-7} cm/sec to 10^{-13} cm/sec). The site is dissected with small arroyos that have developed in the largely silty clay overburden.

The range of ground water depths in the area, based on available well logs and references, ranges from 200 to over 1,000 feet below ground surface (Rush, 1982). Subsurface investigation of the site indicates that there is perched water near the larger ephemeral streams that ranges in depth from 27 to 39 feet.

Test results indicate that the minus 200 fraction of the soils (silt and clay portion) ranges between 5% and 44% in the alluvial areas of the site and between 20% and 90% in other areas of the site. The majority of the site soil would be generally classified as a silty or sandy clay. Soils in the alluvial areas would be classified as either silty gravels or silty sand with gravel. A permeability test conducted on an uncompacted sample had a result of 2.2 x 10^{-4} cm/sec; tests conducted on compacted samples (95% Proctor maximum dry density) had results of 3.2 to 5.4 x 10^{-8} cm/sec.

4.8.1 HELP MODELING

Site conditions and the proposed design of the landfill were used to predict the site water balance and the hydrologic characteristics of the landfill using the computer program Hydrologic Evaluation of Landfill Performance (HELP). HELP calculates runoff, infiltration, evapotranspiration, and flux through the potential landfill. HELP has the option to synthetically produce rainfall based on data from one of 139 default cities in the program database. Grand Junction, Colorado is the closest city to the site which is in the database (85 miles), and which has elevation and climate characteristics similar to Green River. The Grand Junction temperature and precipitation values were modified by entering temperature and precipitation values for Green River, Utah taken from *Utah Climate* (Ashcroft, 1992).

4.8.1.1 HELP Sensitivity Analysis

Two landfill hydrologic performance sensitivity cases were analyzed utilizing the HELP model, which included an active (open cell) case and a post-closure case. Both scenarios were modeled for a period of 20 years. The active period of the landfill is the worst-case scenario because there is significantly less evaporation and runoff than during post-closure conditions. Post-closure conditions were also modeled to predict long-term infiltration through the final cover, and infiltration through the landfill profile into the underlying bedrock.

The active (short-term) case conditions simulate the open waste cell during the commencement of disposal of waste material. The assumed exposed layer for the active case is a waste layer. Runoff in the model is allowed from the surface of the daily cover material. The maximum depth at which evaporation could occur (evaporative zone depth) was set to 30 inches. Because of the proposed phased construction it was assumed that the maximum area that will be exposed at a time is 2 acres. The rest of the cell area either would have been filled and the final cover constructed, or construction would not have started and the existing ground surface would be undisturbed.

The other case models post-closure conditions, simulating the cell after the final cover has been constructed. Runoff was allowed from 100 percent of the area in this case and the evaporative zone depth was set to 30 inches. Soil profiles for the cases are as follows:

OPEN (ACTIVE) CASE - CASE 1

- 6 inch silty clay daily cover material, permeability of 2.5E-5 cm/sec
- 10 ft layer of waste material
- 12-inch ripped and compacted shale layer, permeability of 6.8E-7 cm/sec
- natural shale material

POST-CLOSURE - CASE 2

- 6-inch erosion resistant gravelly sand, permeability of 1E-2 cm/sec
- 24-inch evaporative layer / frost protection of silty sand, permeability of 1.2E-4 cm/sec
- 18-inch compacted shale layer, permeability of 6.8E-7 cm/sec
- 60-feet municipal waste
- 12-inch ripped and compacted shale layer, permeability of 6.8E-7 cm/sec
- natural shale material

4.8.1.2 Results

HELP results indicate that during the open case, minimal infiltration into the underlying shale material took place. The model predicted approximately 0.03130 inches of infiltration per year during the active filling stage of the landfill.

During the closed period of the model, predicting the landfill after the final cover has been placed, HELP predicted no infiltration through the bottom layer of the landfill. In both cases the majority of precipitation evaporates before infiltrating.

TABLE 1
HELP MODELLING RESULTS

WATER PROFILE (average annual totals)	OPEN CASE (in/yr)	CLOSED CASE (in/yr)
Precipitation	6.26	6.26
Runoff	0.304	0.00
Evaporation	5.981	6.256
Infiltration through cover liner	NA	0.00812
Infiltration through bottom liner	0.03130	0.00812

The worst case scenario of the HELP model predicts a minimal amount of percolation into the underlying soil. Given the characteristics and thickness of the underlying Mancos shale formation at the site, and the great depth and poor quality of the groundwater in the area of the site, this percolation should be considered negligible.

5.0 ENGINEERING REPORT

The landfill will receive only municipal solid waste generated within Utah municipalities. Figure 2 presents a detailed topographic map of the facility. The property is relatively flat, sloping approximately 75 feet across approximately 6600 feet from the southeast corner to the northwest corner of the site.

Construction of the landfill will be completed using heavy equipment such as crawler-dozers, excavators, and scrapers. Soil that is removed during construction will be stockpiled on site to be used for daily cover and final cover. Other borrow areas will not be used.

The landfill may receive clean fill material for disposal. Such materials will be used for cover and general grading, as needed. It is estimated that no more than 10% of the final cover material will need to be acquired from off-site at time of closure.

5.1 LOCATION STANDARDS

The proposed site for the Landfill meets the location standards of R315-302-1 (see Section 4.0).

5.2 FACILITY LIFE

Based on the facility design (see following Section 5.3), the total capacity of the site is 22 million cubic yards (Mcy). Accounting for 10% soil cover, the waste capacity of the site is 19.8 Mcy. The total designed capacity of each cell is, Cell 1 = 5 Mcy, Cell 2 = 11 Mcy, and Cell 3 = 6 Mcy

The Solitude Landfill expects to receive approximately 130,000 tons per year for disposal in Cell 1. At present, this waste is projected to arrive in compacted bales, each measuring approximately 2 cy and weighing approximately 1,400 pounds. Based on these assumptions, Cell 1 would have an approximate life of 12.12 years.

$$\frac{130{,}000 \text{ tons} \times 2{,}000}{1{,}400 \text{ lbs} / 2 \text{ cy}} = \frac{260{,}000{,}000 \text{ lbs}}{700 \text{ lbs/cy}}$$

$$\frac{260{,}000{,}000 \text{ lbs}}{700 \text{ lbs/cy}} = 371{,}428.57 \text{ cy}$$

$$\frac{5{,}000{,}000 \text{ cy} \times 0.9}{371{,}428.57 \text{ cy} / \text{year}} = 12.12 \text{ years}$$

Cells 2 and 3 are not currently planned for a specific user; however, potential users have been identified that could generate from 300,000 to 750,000 tons per year (tpy) for disposal. The following assumptions for calculating facility life are based on a maximum usage scenario.

- Cell 2 is filled and closed prior to Cell 3
- The maximum annual volume of waste (750,000 tpy) is received
- All waste in Cells 2 and 3 is co-mingled
- All waste in Cells 2 and 3 is delivered loosely compacted (400 – 800 lbs/cy)
- All waste is compacted on-site to an average density of 1,200 lbs/cy
- Daily cover soil will equal 10% of total volume

Based on those assumptions, the facility will dispose of 1,250,000 cubic yards of waste per year plus 125,000 cubic yards of soil for a total volume of 1,375,000 cubic yards per year. Since Cells 2 and 3 have a combined total designed capacity of 17 Mcy, the calculated facility life is approximately 12.36 years.

5.3 CELL DESIGN – R315-303-3(3)(c) EQUIVALENT DESIGN

The Owner requests approval by the Executive Secretary for an Equivalent Design, incorporating no liners or leachate collection systems, based on operating practices and location characteristics which minimize the migration of solid waste constituents or leachate into the ground or surface water and which are at least as effective as the liners of R315-303-3(3)(a) or (b). This standard, as well as the standard of R315-303-2(1), is demonstrated in Section Four, Geohydrological Report, and is based on 1) the hydrogeologic characteristics of the facility and the surrounding land, 2) the climatic factors of the area, 3) the volume and physical and chemical characteristics of the leachate and 4) predictions (HELP model) that maximize leachate generation. Additionally, operating procedures at each landfill cell minimize the working face and, consequently, minimize potential surface area for leachate generation from precipitation.

5.3.1 General Description

Each cell will be constructed for a designated municipality or group of municipalities, and may be operated as a bale-fill or as a traditional "compacted loose-waste" fill. No cell will be constructed prior to completion of a contract with a Utah municipality to dispose of MSW generated within that municipality.

Each of the three disposal cells will be constructed below ground surface in the initial phase (see Drawings 1 through 10, attached) with 3:1 slopes to the bottom of the excavation. Excavated soil will be used to construct berms around each cell (Drawings 4 and 6) to provide support for above-grade waste disposal. Cell depth ranges between 30 and 35 feet below the natural ground surface. The depth decreases towards the south end to facilitate stormwater collection.

The side-slopes of the excavation are proposed to be 3 horizontal to 1 vertical. An extensive field investigation included exploratory drill holes on the property and data collected indicated a silty clay zone of soil to depths of at least 20 feet below the surface. Silty clay soil should provide the slope stability necessary for any temporary 3:1 side-slopes. The side-slopes may be flattened at the discretion of the landfill operator, to maintain

stability of the slopes. Berms will be located adjacent to the top of the vertical slopes (Drawings 4 and 6) to maintain an adequate safe distance of personnel and vehicular traffic from the top of the slope and to provide stormwater diversion. The berms will be constructed of stockpiled material from the excavated cell. Berms will be located an adequate distance away from the edge of the cell to avoid any stability problems.

5.3.2 Phasing

Cells 1 and 3 will be constructed in an orderly sequence, generally from north to south, while Cell 2 will be constructed generally from west to east (Drawings 8, 9 and 10). The natural ground surface elevation at the site varies approximately 100 feet as the topography slopes downward from the southeast to the northwest. Natural grade at the center of the cells is approximately 4335 feet (Cell 1), 4353 (Cell 2), and 4380 (Cell 3). The final elevation of the maximum cover section of each cell will be approximately 64 feet above these elevations. The final cover will be graded to a minimum 3 percent slope extending across the crown of a cell.

The working face in a traditional-fill cell will be constructed to a maximum slope of 4 horizontal to 1 vertical; for a bale-fill, the working face will be constructed to a maximum slope of 2 horizontal to 1 vertical based on slope stability of stacked bales. Cover material will be soil from the excavation of cells. Unloading of waste will be restricted to one area of the working face to limit the amount of waste exposed and the amount requiring cover. The working face will be covered on a daily basis.

5.3.3. Daily, Intermediate and Final Cover.

An intermediate cover will be placed over the completed areas of a cell. The intermediate cover will consist of a minimum thickness of 12-inches of native soil stockpiled from the excavation. The intermediate cover will be compacted by a crawler-dozer to facilitate trafficability over the completed cells. Gravel may be placed over the intermediate cover in the unloading areas at the top of the working face to improve trafficability.

Following the complete filling of an excavation cell to the top of the side berms, MSW will be disposed above grade across the surface of the cell. This disposal area will rise to a height of approximately 35 feet above natural grade and sloped to the center crown of the cell at a 3:1 slope. The final phase of disposal operations will be the commencement of closure operations by placement of final cover.

The final cover will consist of 24 inches of frost protection cover placed over 18 inches of compacted native clay with an in-place permeability of no greater than 1×10^{-7} cm/sec. Six inches of coarse aggregate will be placed over the cell for erosion control. The cover requirements are also discussed in detail in the following subsections covering final closure.

5.4 EQUIPMENT REQUIREMENTS AND AVAILABILITY

Equipment will be maintained and stored in one of two maintenance buildings, one located on site and one located off site. Landfill operating equipment may be shared between landfill cells, but will be specific to the type of disposal, i.e. bale-fill or traditional-fill. The Landfill Operator/Manager will have a utility truck capable of moving around the site during inclement weather and powerful enough to pull smaller trailer-mounted equipment that may be needed at the site. This vehicle will carry whatever tools are necessary for routine maintenance of the heavy equipment.

5.4.1 Bale-Fill Equipment

A bale-fill cell will require one or more fork-trucks capable of lifting the bales from a flatbed truck and placing them into the working face. Additionally, the flatbed trucks may be equipped with an a crane capable of moving the bales from the truck to the working face. The only other piece of equipment necessary for operation of the bale-fill will be a crawler-dozer capable of moving cover material to the working face and then spreading it across the working face.

5.4.2 Traditional-Fill Equipment

Traditional landfilling operations will require at least two pieces of equipment, one compactor and one crawler-dozer. The compactor will be designed for landfill operations, and will be equipped with compactor wheels. The crawler-dozer will be capable of moving and spreading cover material as well as loose MSW.

5.5 BORROW SOURCES

The construction of the landfill will necessarily require excavation and stockpiling of soil. As the excavation of the below-grade phases continue, soil will be stockpiled on site and, when possible, within the boundary of the cell being excavated. The Landfill will provide sufficient cover materials from on-site excavation, and no additional borrow areas should be required.

5.6 RUN-OFF COLLECTION

Potential stormwater run-off has been identified from two sources. First is the run-off that may contact waste in the excavation phase of disposal and would subsequently collect within the excavation. This run-off water may be allowed to evaporate or may be pumped to the top of the working face. No treatment is anticipated or proposed.

The second type of run-off is that which will move from the above grade disposal area to ground level. This may be stormwater that has contacted waste or it may be stormwater that sheets off the intermediate or final cover. In either event, this run-off water will be collected in the stormwater detention areas shown on Drawings 8, 9, and 10. This water will not be permitted to exit the property.

5.7 GROUNDWATER MONITORING – WAIVER REQUEST

In accordance with R315-308-1(3), the owner requests a waiver of groundwater monitoring requirements by the Executive Secretary based on the demonstration that there is no potential for migration of hazardous constituents from the facility to the groundwater during the active life of the facility and the post-closure care period. This demonstration is provided in Section Four, Geohydrological Report, and is based on 1) site-specific field-collected

measurements, sampling, and analysis of physical, chemical, and biological processes affecting contaminant fate and transport, and 2) contaminant fate and transport predictions that maximize contaminant migration and consider impacts on human health and the environment.

5.8 RUN-ON / RUN-OFF CONTROL SYSTEMS

Stormwater diversion ditches will be constructed using berms and designed to prevent stormwater from running on to the landfill site. These same diversion ditches will also serve to prevent stormwater run-off from leaving the site. These stormwater controls are shown in detail on Drawing 7.

6.0 CLOSURE PLAN

Final closure activities will be implemented when the final phase of the landfill has been completed and the design dimensions have bee reached, projected during the first quarter of 2014. Closure of the landfill will begin, however, as each cell completes the final phases of construction and design elevations are reached. These activities will eliminate the need to complete final closure on the entire 320 acres above grade. Closure of the site is to be performed in such a manner as to minimize potential effects of the landfill on the surrounding environment.

6.1 CLOSURE SCHEDULE

Final closure activities at the landfill will commence within 30 days after final placement of waste and shall be completed within 180 days. It has been estimated that the last cell to close will cease accepting waste in 2014.

6.2 DESIGN OF FINAL COVER

The closure of the landfill operations at the Solitude Landfill will minimize the need for further maintenance and will minimize any potential threat to human health and the environment. As a cell is constructed and filled above grade, the side slopes will be covered with 18 inches of compacted clay (Mancos shale), 24 inches of native soil comprising a frost protection layer, and six inches of coarse aggregate. This process will be used so that only the uppermost 2-acre portion of a cell requires closure at any one time. After the final waste has been placed in a cell, the upper surface will be covered in a manner identical to the side slopes described above.

The final grades will be maintained at the designed slope of 4:1. The final contour plan of the cell closure is presented as Drawing 5. All run-off will be directed off and around the disposal cell.

6.3 SITE CAPACITY

The estimated total capacity of the landfill is approximately 17,000,000 cubic yards of waste.

6.4 FINAL INSPECTION

A final inspection will be performed at the Solitude Landfill at the termination of all landfill activities, including closure. The final inspection will determine if the landfill meets the closure requirements as outlined in the permit and closure plans. Inspection may include cell cover design requirements and maintenance of proper final grade on the cell to promote run-off.

7.0 POST-CLOSURE CARE

During the post-closure period, the landfill shall be inspected quarterly to determine the integrity of the cover and condition of the access road. Post-closure maintenance will consist of quarterly inspection of the cover, run-on/run-off control structures, and the monitoring structures, and making any necessary repairs.

7.1 SITE MONITORING

In addition to the annual inspections, post-closure monitoring of the landfill will include quarterly sampling for methane gas. Methane gas will be monitored at the perimeter of the landfill and within any buildings at the landfill during the post-closure period.

7.2 CHANGES TO TITLE, LAND USE AND ZONING

Plats and a statement of fact concerning the location of the disposal site shall be recorded as part of the record of title with the county recorder within 60 days after certification of closure.

7.3 MAINTENANCE ACTIVITIES

Post-closure maintenance will consist of quarterly inspections of the cover, run-on/run-off control structures, and the monitoring structures, and making any necessary repairs.

7.4 FINAL COVER

The final cover will be constructed on the uppermost surface of the cell after the waste placement has reached the designed elevation. The side slopes will have been closed, as the cell height increases, with 18 inches of compacted clay (Mancos shale), 24 inches of native soil comprising a frost protection layer, and six inches of coarse aggregate. The final cover material on the uppermost surface of the Solitude Landfill will be identical to the side slopes. The side slopes will be constructed with a maximum 4:1 slope and the upper surface will be constructed with a minimum 3% slope toward the crest of the side slopes.

Precipitation on the landfill cells will drain across the cell cover, through the run-off control berms, and off site.

7.5 RUN-ON / RUN-OFF CONTROL SYSTEMS

Run-on and run-off control systems are described elsewhere in Section 3.6.2 and Section 5.8.

7.6 CONTACT PERSONS

Local Contact: Pete Fote
2825 East Cottonwood Parkway, Suite 500
Salt Lake City, UT 84121
801-990-2345

8.0 FINANCIAL ASSURANCE

An estimate for the closure and post-closure care of the Solitude landfill is summarized in Tables 4 and 5. The estimate is based on the total area for final closure of 2 acres, and an entire cell area of 71 acres each for Cells 1 and 3, and 120 acres for Cell 2. All soil will come from on-site. These tables reflect the maximum area requiring closure at any one time, and has been compiled from information developed by the Oklahoma Department of Environmental Quality for estimating closure and post-closure care costs (see Section Nine)

Table 4
Summary of Estimated Closure & Post-Closure Costs for Cell 1 or 3

Task / Service	Quantity	Units	Unit Cost	Task Cost
Conduct Site Evaluation	1	Lump Sum	$2,750	$2,750
Remove Buildings & Equipment	1	Lump Sum	$2,450	$2,450
Final Grading	2	Acres	$1,122	$2,244
Move & Compact On-Site Clay	4,840	Cubic Yds	$3.00	$14,520
Move & Place Cover Soil & Aggregate	8,067	Cubic Yds	$4.66	$37,592
Post-Closure Inspections[1]	120	Events	$500	$60,000
Methane Gas Monitoring[2]	120	Events	$140	$16,800
Repair / Maintain Cover[3]	4,260	Cubic Yds	$4.66	$19,852
Subtotal				**$156,208**
Technical & Professional Services	1	Lump Sum	7%	$11,915
Contingency	1	Lump Sum	10%	$16,812
Total				**$184,935**

Table 5
Summary of Estimated Closure & Post-Closure Costs for Cell 2

Task / Service	Quantity	Units	Unit Cost	Task Cost
Conduct Site Evaluation	1	Lump Sum	$2,750	$2,750
Remove Buildings & Equipment	1	Lump Sum	$2,450	$2,450
Final Grading	2	Acres	$1,122	$2,244
Move & Compact On-Site Clay	4,840	Cubic Yds	$3.00	$14,520
Move & Place Cover Soil & Aggregate	8,067	Cubic Yds	$4.66	$37,592
Post-Closure Inspections[1]	120	Events	$500	$60,000
Methane Gas Monitoring[2]	120	Events	$140	$16,800
Repair / Maintain Cover[3]	7,200	Cubic Yds	$3.00	$21,600
Subtotal				**$157,956**
Technical & Professional Services	1	Lump Sum	7%	$14,384
Contingency	1	Lump Sum	10%	$17,234
Total				**$189,574**

NOTES TO TABLES:

[1] May be reduced to annual inspections upon site stabilization, with DEQ approval

NOTES TO TABLES:

[1] May be reduced to annual inspections upon site stabilization, with DEQ approval

[2] May be discontinued upon site stabilization, with DEQ approval

[3] Calculated at 2 cy/acre x 120 acres x 30 years

8.1 FINANCIAL ASSURANCE MECHANISM

The Owners propose to use a bond as the financial assurance mechanism. Each Cell will have its own bond as an individual funding mechanism.

9.0 REFERENCES

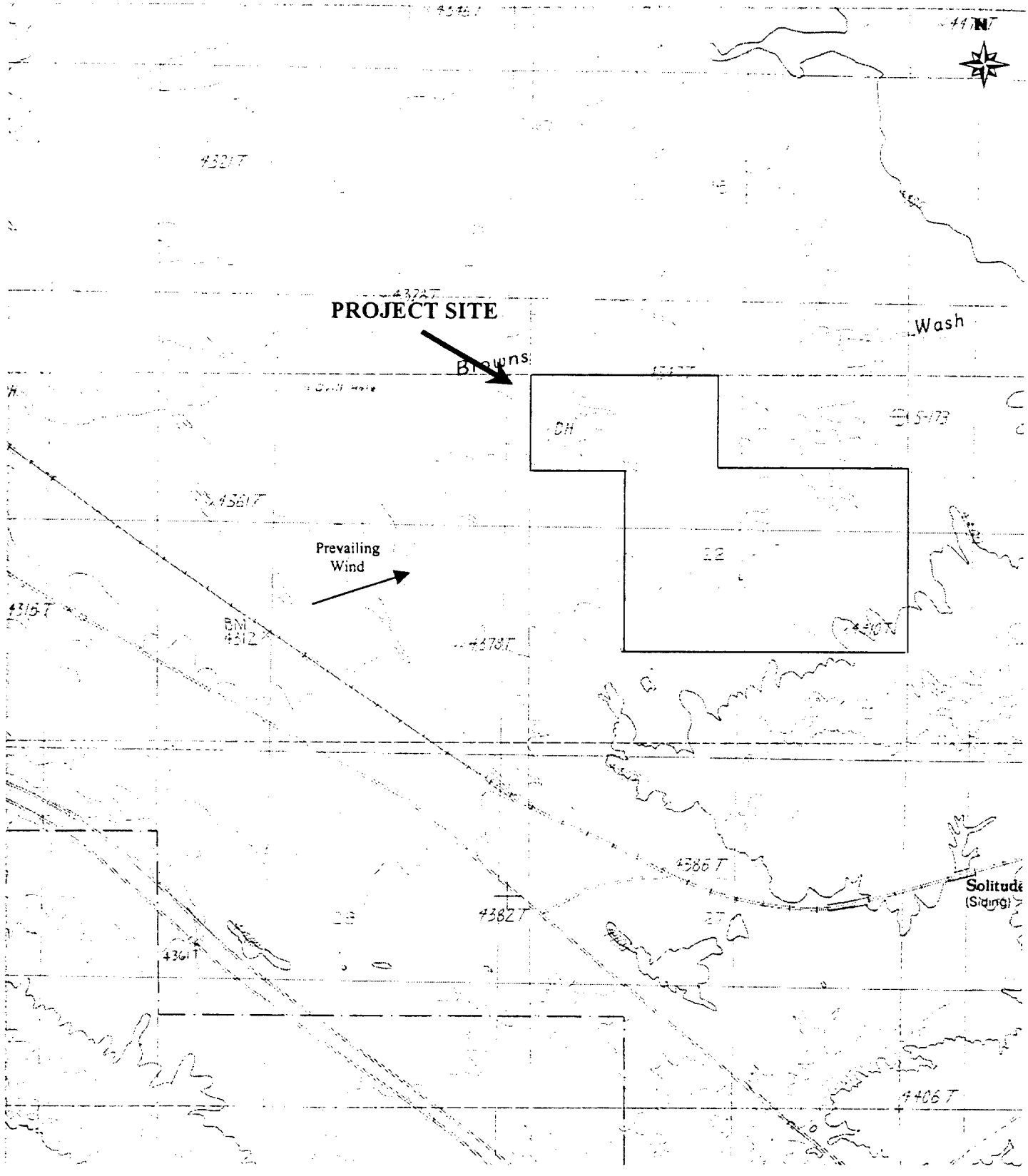
Ashcroft, G.L., Jensen, D.T., Brown, J.L., 1992, *Utah Climate*, Utah Climate Center, Utah State University.

Rush, F.E., 1982, *Regional Hydrology of the Green River – Moab Area, Northwestern Paradox Basin, Utah,* USGS, Denver CO.

Thiros, S.A. and W. C. Brothers, *USGS Technical Publication 102* - Ground-water hydrology of the upper Sevier River basin, south-central Utah, and simulation of ground-water flow in the valley-fill aquifer in Panguitch Valley, 1993.

State of Oklahoma, Department of Environmental Quality, Waste Management Division, *Solid Waste Financial Assurance Program Report*, December 22, 2000.

State of Utah, 2001, *Administrative Rules, Solid Waste Permitting and Management Rules R315-301 through 320*, Department of Environmental Quality, Division of Solid and Hazardous Waste.

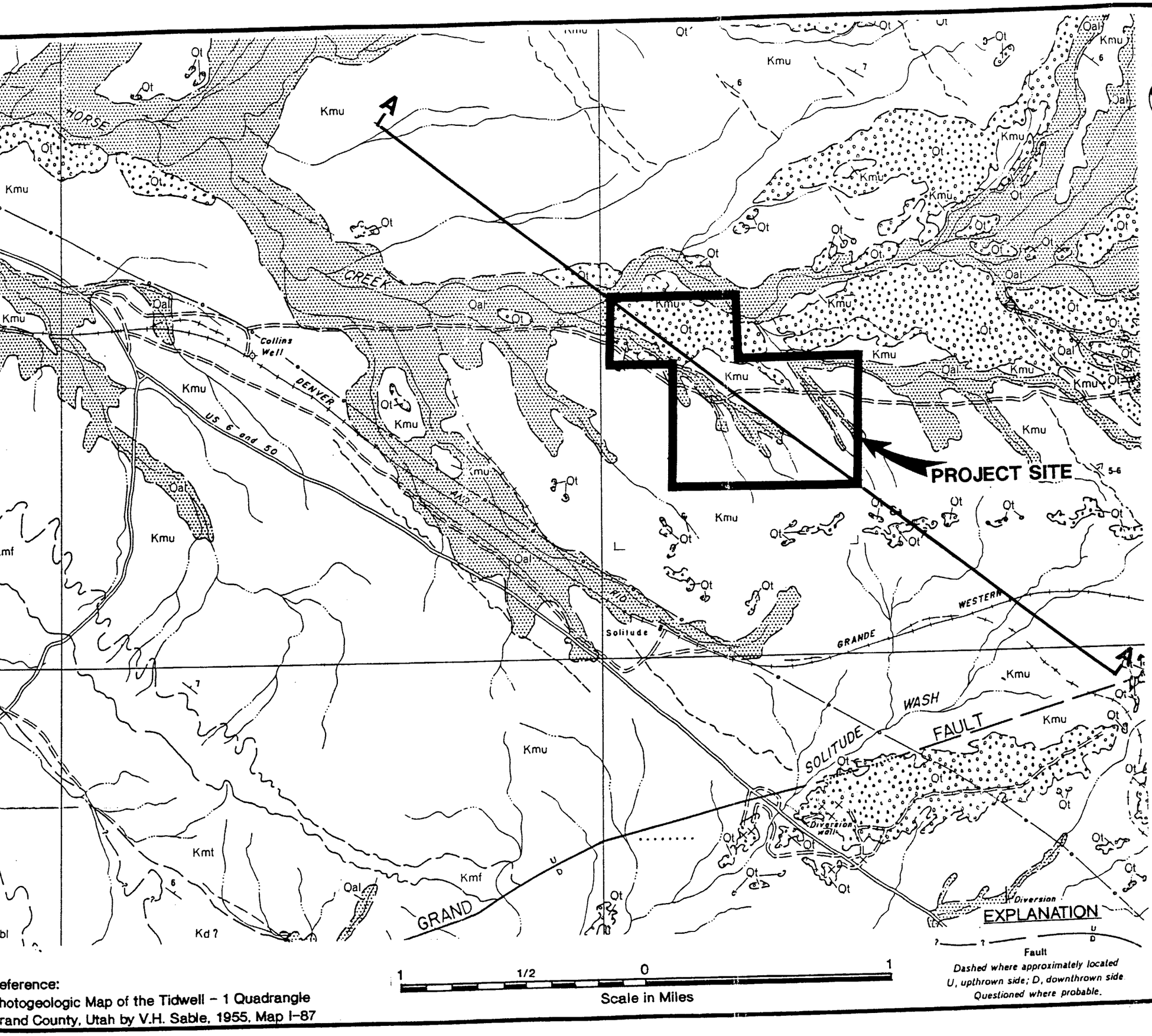


ATC ASSOCIATES INC
2681 Parleys Way, Suite 106
Salt Lake City, Utah 84109
(801) 412-0003

Green River NE Quadrangle
Utah-Grand Co.
7.5 Minute Series (Topographic)

SCALE: 1:24,000
CONTOUR INTERVAL 40 FEET

FIGURE 1



EXPLANATION

- Qal — Alluvium
- Ot — Terrace deposits (?)
- Qu — Undifferentiated sand, residual mantle, and slope wash

QUATERNARY

CRETACEOUS

Upper Cretaceous

- Kmu / Kmf / Kmt — Mancos shale: Upper part, undifferentiated, Kmu; Ferron sandstone member, Kmf; Tununk shale member, Kmt

Lower and Upper Cretaceous

- Kd — Dakota sandstone

Lower Cretaceous

- Kbu / Kbl — Probable equivalent of Burro Canyon formation: Upper unit, Kbu; lower unit, Kbl

JURASSIC

Upper Jurassic

- Jmb / Jms — Morrison formation: Brushy Basin shale member, Jmb; Salt Wash sandstone member, Jms
- Js — Summerville formation
- Jcu — Curtis formation

Fault

Dashed where approximately located
U, upthrown side; D, downthrown side
Questioned where probable.

1 1/2 0 1

Scale in Miles

Reference:
Photogeologic Map of the Tidwell – 1 Quadrangle
Grand County, Utah by V.H. Sable, 1955, Map I-87

GREEN RIVER LANDFILL L.L.C.

GREEN RIVER LANDFILL

GEOLOGIC MAP

BINGHAM ENVIRONMENTAL
SALT LAKE CITY – (801) 532-2230

FIGURE 2

Date NOV. 1994 | Proj. # 2106-006 | Sht of

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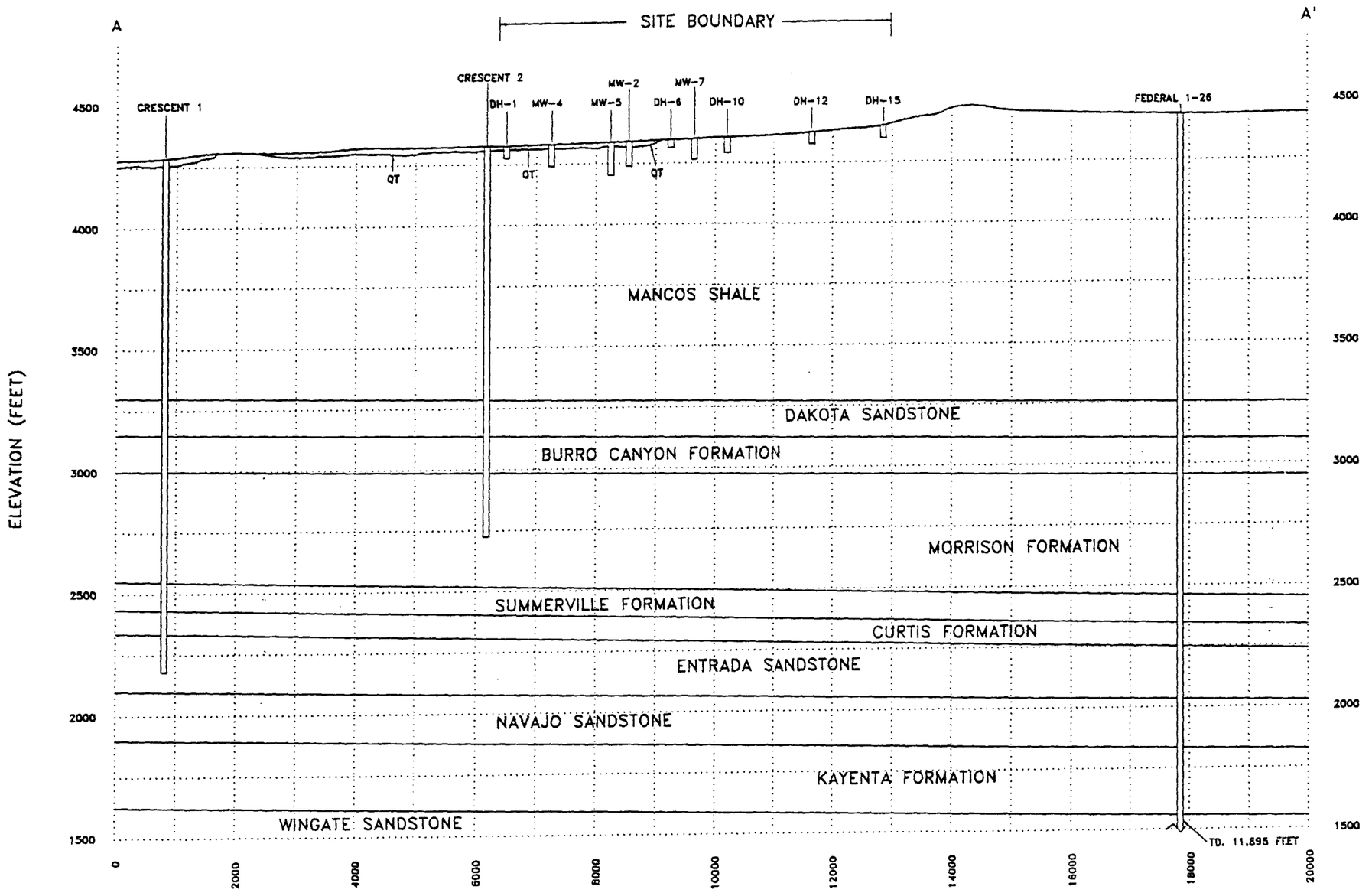

0 1000 2000
Scale in Feet
HORIZONTAL SCALE

0 250 500
Scale in Feet
VERTICAL SCALE

QT- TERRACE DEPOSITS

GREEN RIVER LANDFILL L.L.C.

GREEN RIVER LANDFILL

CONCEPTUAL GEOLOGICAL CROSS SECTION A-A'

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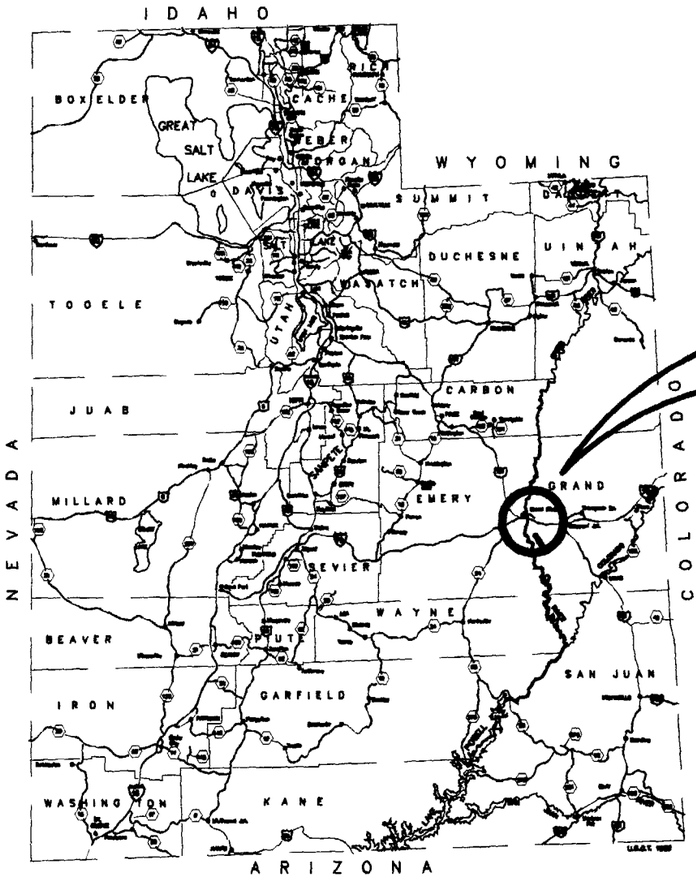
FIGURE 3

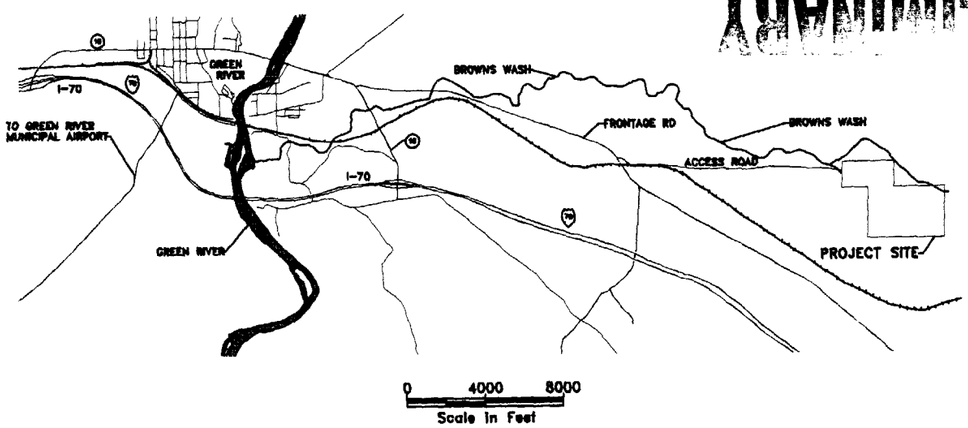
Rev.	By	Date	Remarks	Date NOV 1994	Proj. #	JSR

SOLITUDE LANDFILL

(PERMIT DRAWINGS)



LOCATION MAP



VICINITY MAP

DRAWING LIST

Not For Construction

PRELIMINARY

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NOTICE
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LICENSED PROFESSIONAL ENGINEER
No. 186632
KEVIN B. COSPER
STATE OF UTAH

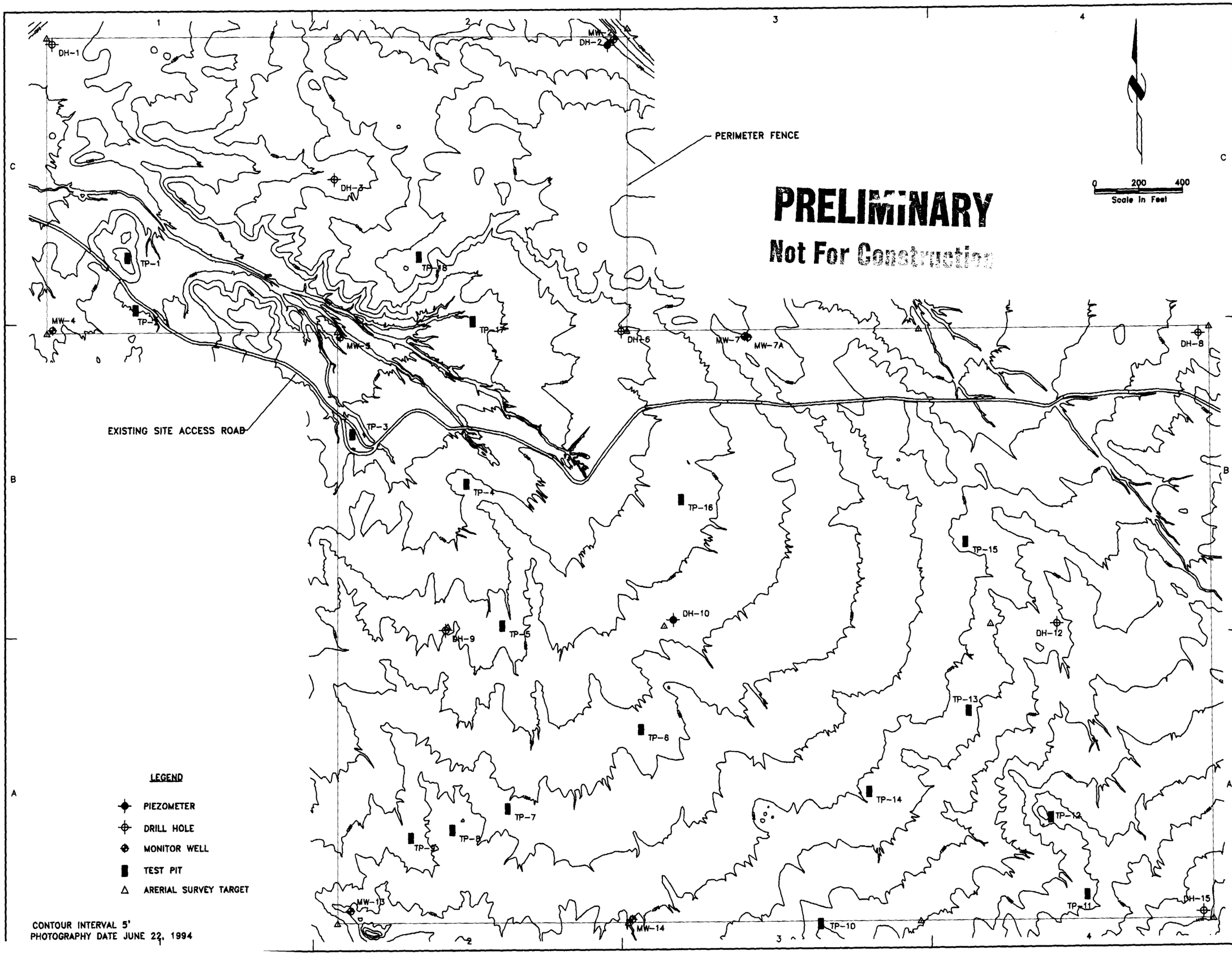
MARK	DATE	DESCRIPTION
	8/29/02	FINAL PERMIT SUB.
	02/11/02	PERMIT SUBMITTAL
	01/11/02	DRAFT

ISSUE:
PROJECT NO:
CAD DWG FILE:
DRAWN BY:
CHECKED BY:

SHEET TITLE
SOLITUDE LANDFILL
COVER SHEET

FOR GENERAL PURPOSES ONLY NOT FOR CONSTRUCTION

1



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NOTICE
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LICENSED PROFESSIONAL ENGINEER
No. 186632
KEVIN B. COSPER
STATE OF UTAH

MARK	DATE	DESCRIPTION
	8/29/02	FINAL PERMIT SUB.
	02/11/02	PERMIT SUBMITTAL
	01/11/02	DRAFT

ISSUE:
PROJECT NO:
CAD DWG FILE:
DRAWN BY:
CHECKED BY:

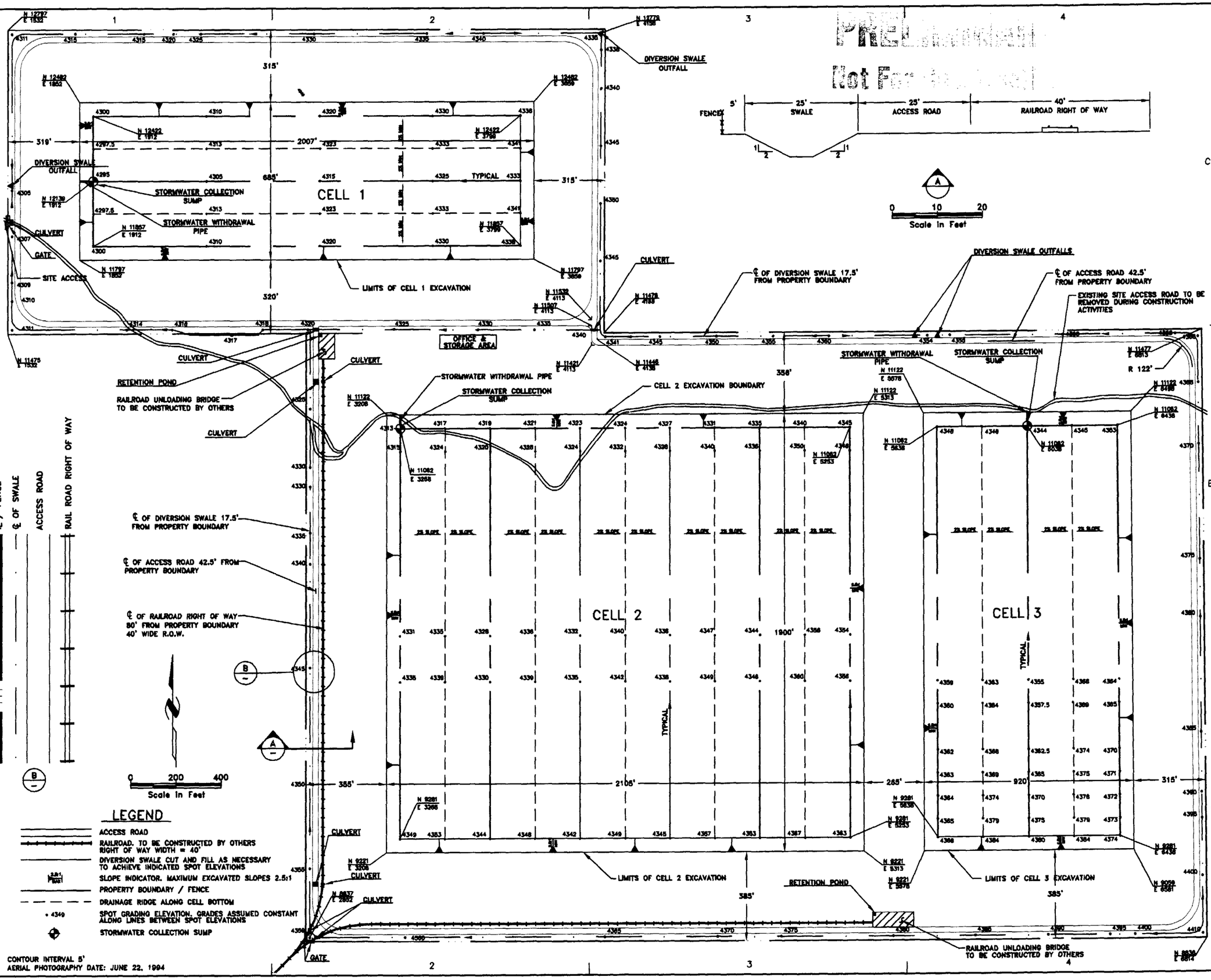
SHEET TITLE

SOLITUDE LANDFILL

GENERAL SITE PLAN

FOR PROPOSED PURPOSES ONLY NOT FOR CONSTRUCTION

2



LEGEND

- ACCESS ROAD
- RAILROAD. TO BE CONSTRUCTED BY OTHERS RIGHT OF WAY WIDTH = 40'
- DIVERSION SWALE CUT AND FILL AS NECESSARY TO ACHIEVE INDICATED SPOT ELEVATIONS
- SLOPE INDICATOR. MAXIMUM EXCAVATED SLOPES 2.5:1
- PROPERTY BOUNDARY / FENCE
- DRAINAGE RIDGE ALONG CELL BOTTOM
- • 4349 SPOT GRADING ELEVATION. GRADES ASSUMED CONSTANT ALONG LINES BETWEEN SPOT ELEVATIONS
- STORMWATER COLLECTION SUMP

CONTOUR INTERVAL 5'
AERIAL PHOTOGRAPHY DATE: JUNE 22, 1994

ATC Associates, Inc.
2681 Parleys Way
Suite 106
Salt Lake City, Ut 84109
(801) 412-0003

CONSULTANTS

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NOTICE
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LICENSED PROFESSIONAL ENGINEER
No. 186632
KEVIN B. COSPER
STATE OF UTAH

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ISSUE:
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SOLITUDE LANDFILL
SITE PREPARATION GRADING PLAN

FOR PROPOSED PURPOSES ONLY NOT FOR CONSTRUCTION

PRELIMINARY

Not For Construction

NOTES:

1. BERMS TO BE CONSTRUCTED WITH EXCAVATED MANCOS SHALE. BREAK THE PLATELY BLOCKS TO 8-INCH MINUS PRIOR TO PLACEMENT. PLACE MATERIAL IN LOOSE LIFTS NOT TO EXCEED 12 INCHES IN THICKNESS. COMPACT WITH A SHEEPSFOOT ROLLER HAVING SUFFICIENT WEIGHT TO COMPACT THIS TYPE OF MATERIAL (MINIMUM 3 PASSES).
2. BERM CRESTS TO BE OVERLAIN WITH 6 INCHES OF 1 1/2-INCH MINUS ROAD BASE TO SERVE AS DRIVING SURFACE AND FUTURE DRAINAGE SWALE.
3. ACCESS ROADS TO BERM CRESTS HAVE MAXIMUM GRADE OF 10%.

0 200 400
Scale In Feet

STORMWATER WITHDRAWAL PIPE
CELL 1
SEE SHEET 3
STORMWATER COLLECTION SUMP
SITE ACCESS
ACCESS ROAD TO BERM CREST
OFFICE & STORAGE AREA
CULVERT
CULVERT
DRAINAGE CHANNEL
STORMWATER WITHDRAWAL PIPE
STORMWATER COLLECTION SUMP
ACCESS ROAD TO BERM CREST
STORMWATER WITHDRAWAL PIPE
STORMWATER WITHDRAWAL SUMP
CELL 2
SEE SHEET 3
CELL 3
SEE SHEET 3
DRAINAGE CHANNEL
CULVERT
CULVERT

LEGEND

- ACCESS ROAD
- RAILROAD
- DIVERSION SWALE.
- 3:1 MAX — SLOPE INDICATOR. MAXIMUM BERM SLOPES 3:1
- PROPERTY BOUNDARY / FENCE
- × 4349 — SPOT GRADING ELEVATION. GRADES ASSUMED CONSTANT ALONG LINES BETWEEN SPOT ELEVATIONS
- STORMWATER COLLECTION SUMP

CONTOUR INTERVAL 5'
AERIAL PHOTOGRAPHY DATE: JUNE 22, 1994

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LICENSED PROFESSIONAL ENGINEER
No. 186632
KEVIN B. COSPER
STATE OF UTAH

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ISSUE:
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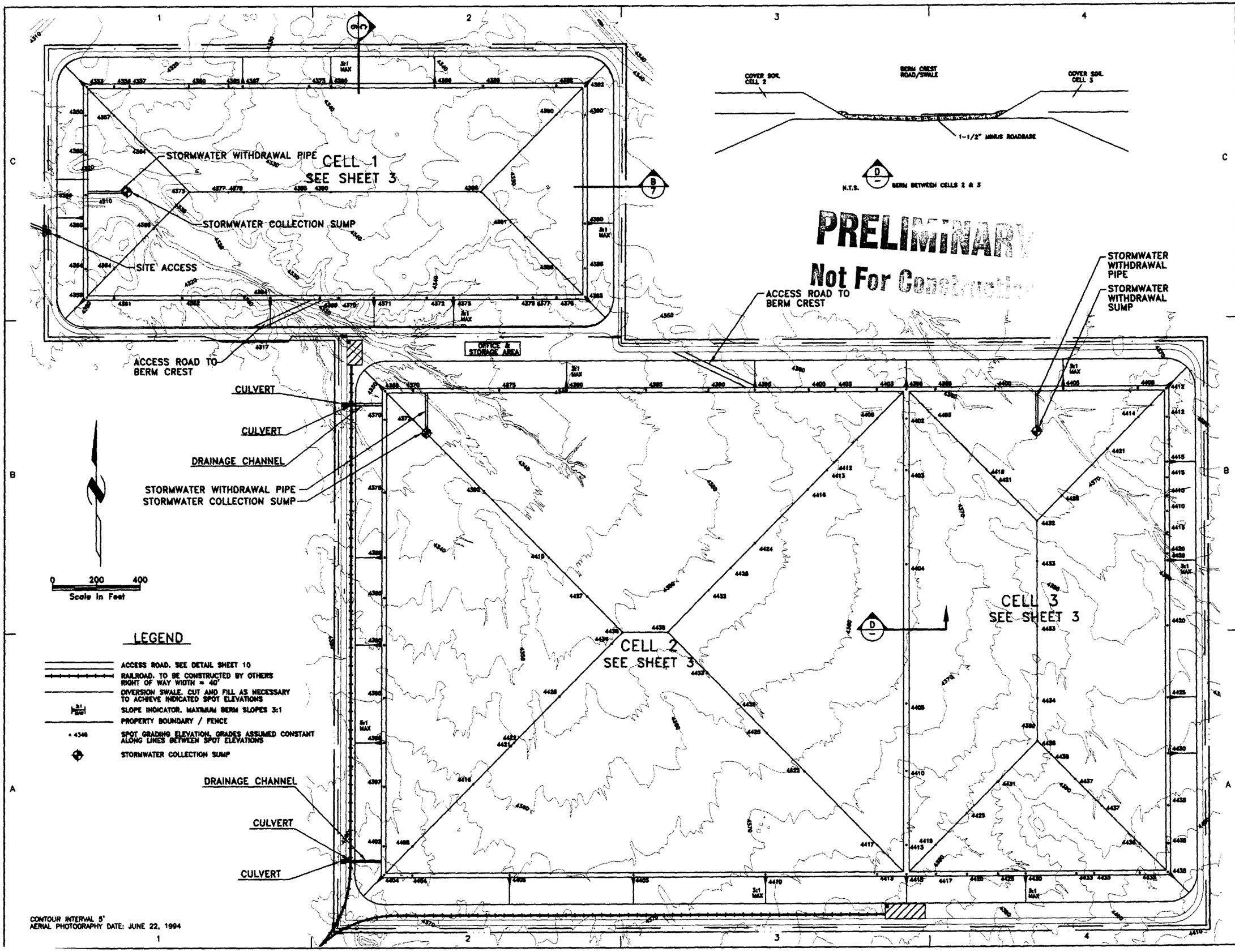
SHEET TITLE

SOLITUDE LANDFILL
BERM CONSTRUCTION PLAN

FOR PRELIMINARY PURPOSES ONLY NOT FOR CONSTRUCTION

4



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NOTES:
1. SPOT ELEVATIONS ON COVER REPRESENT FINAL GRADE [illegible] MULCH LAYER.

LICENSED PROFESSIONAL ENGINEER
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KEVIN B. COSPER
STATE OF UTAH

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ISSUE:
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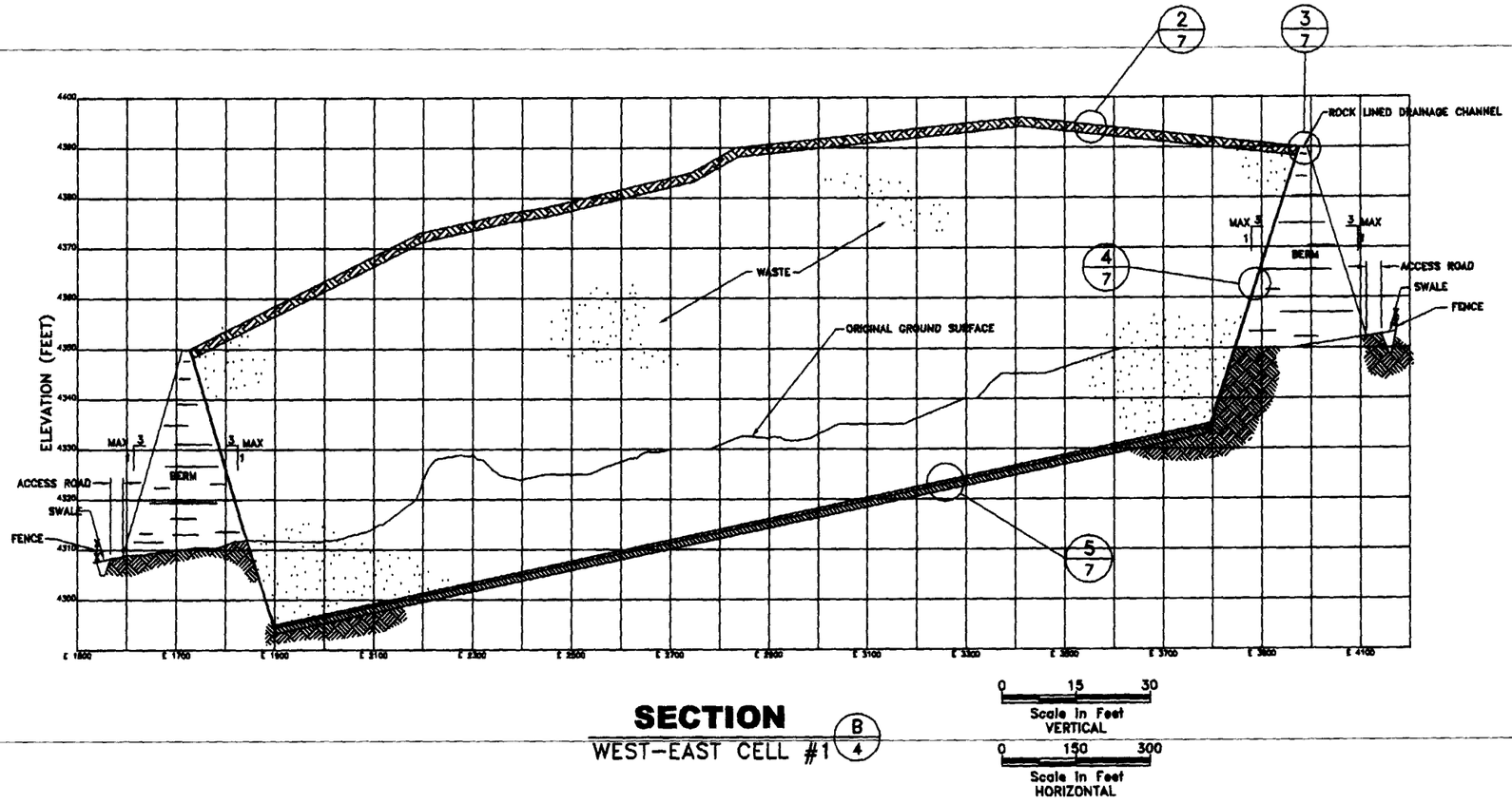
SHEET TITLE
SOLITUDE LANDFILL
CELL COVER

FOR PERMITTING PURPOSES ONLY NOT FOR CONSTRUCTION

5



SECTION (B/4)

WEST-EAST CELL #1

0 15 30
Scale In Feet
VERTICAL

0 150 300
Scale In Feet
HORIZONTAL

PRELIMINARY

Not For Construction

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SHEET TITLE
SOLITUDE LANDFILL

SECTION

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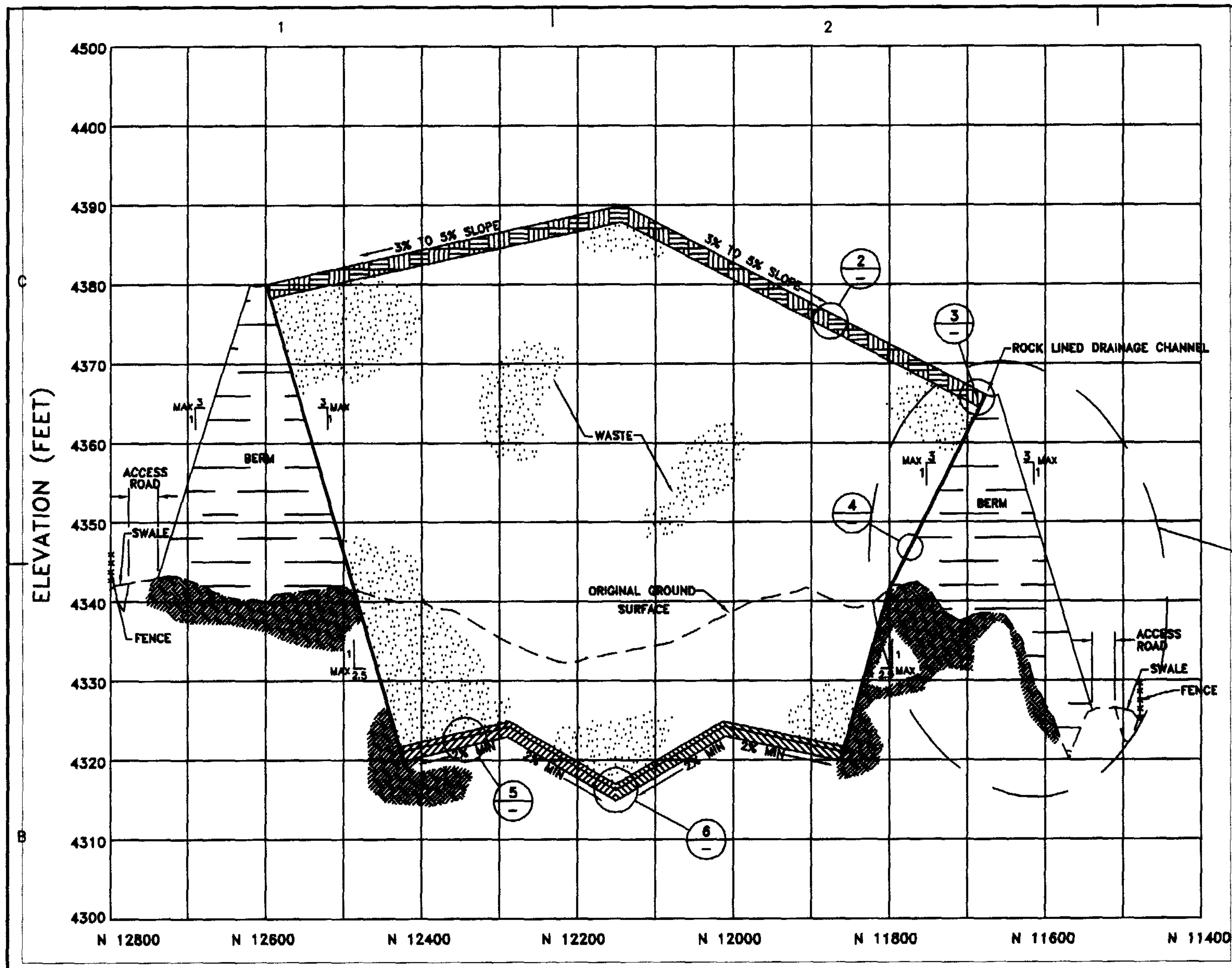
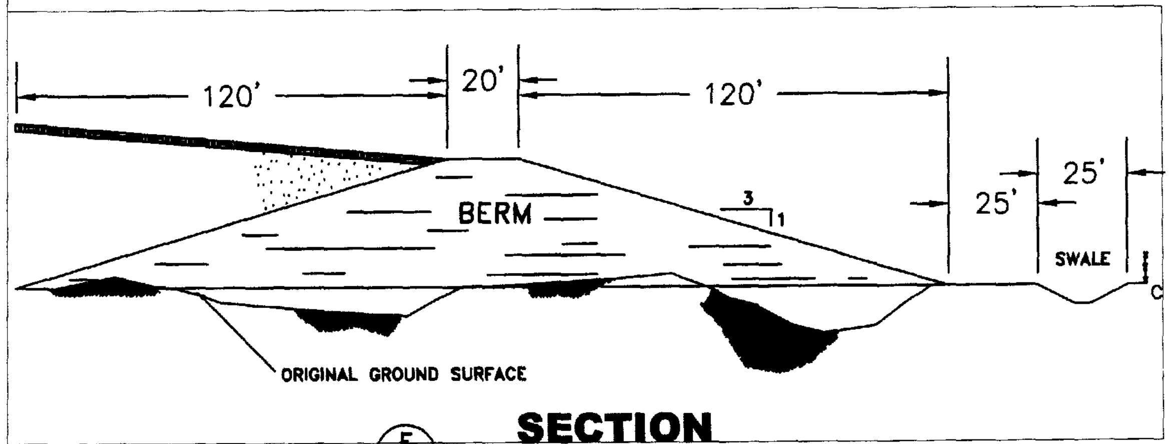


Scale In Feet VERTICAL (0 10 20)

Scale In Feet HORIZONTAL (0 100 200)

SECTION C/4

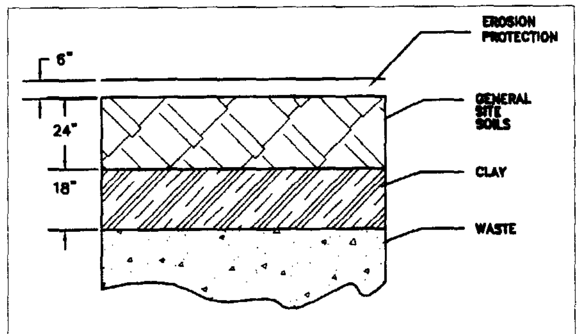
NORTH-SOUTH CELL#1



SECTION E

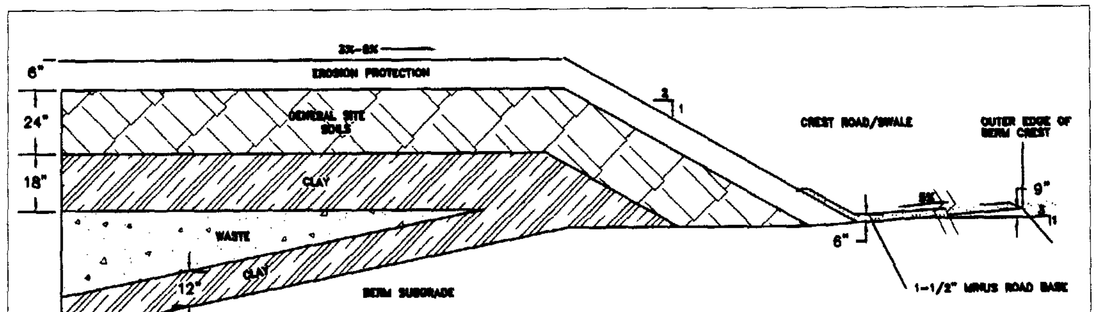
BERM

Scale In Feet (0 30 60)



DETAIL 2/6 CELL COVER

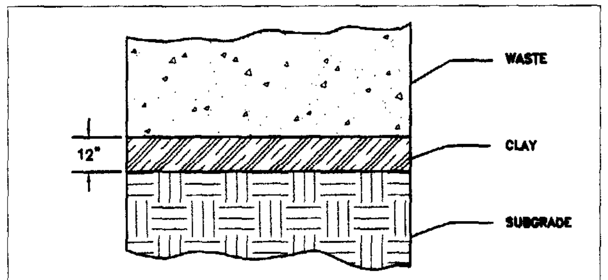
N.T.S.



DETAIL 3/6 COVER/TOE

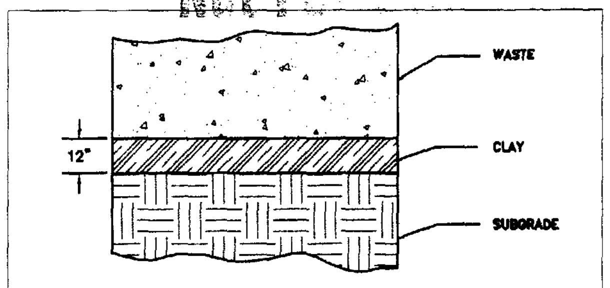
PRELIMINARY

Not For Construction



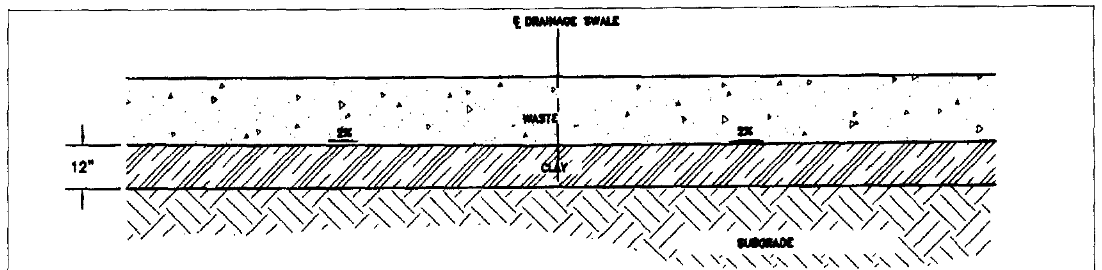
DETAIL 4/6 CELL LINER (CELL SIDE SLOPES)

N.T.S.



DETAIL 5/6 CELL LINER

N.T.S.



DETAIL 6 CELL DRAINAGE

N.T.S.

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ROAD

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LICENSED PROFESSIONAL ENGINEER No. 186632 KEVIN B. COSPER STATE OF UTAH

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SOLITUDE LANDFILL

SECTIONS AND DETAILS

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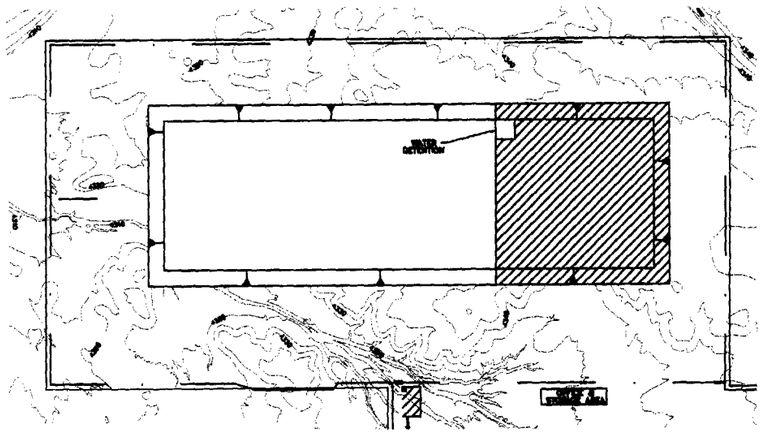
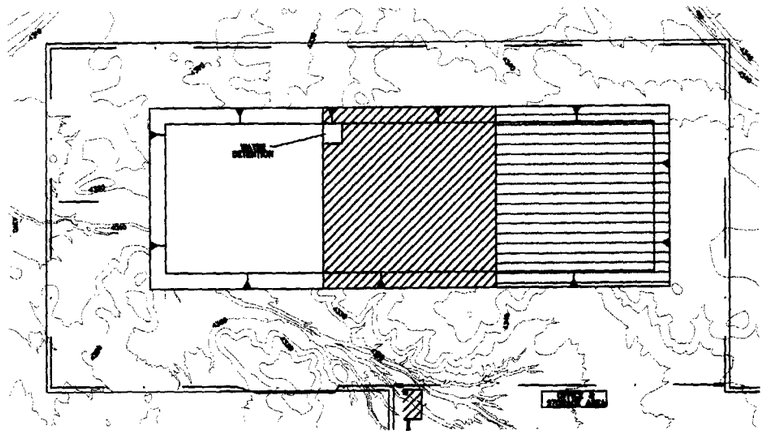
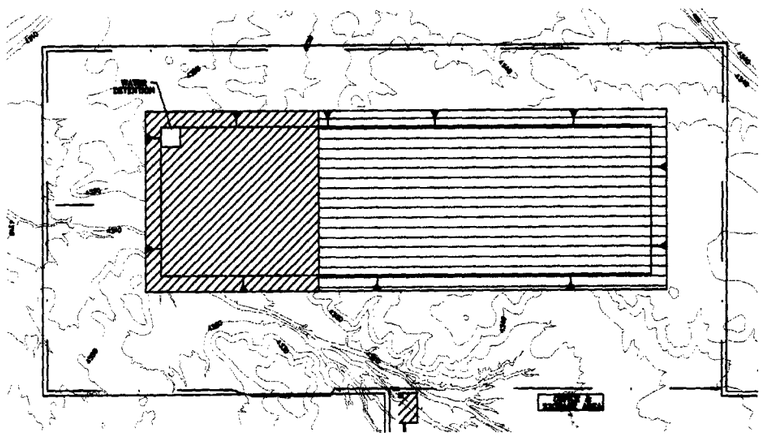
7



PHASE I



PHASE II



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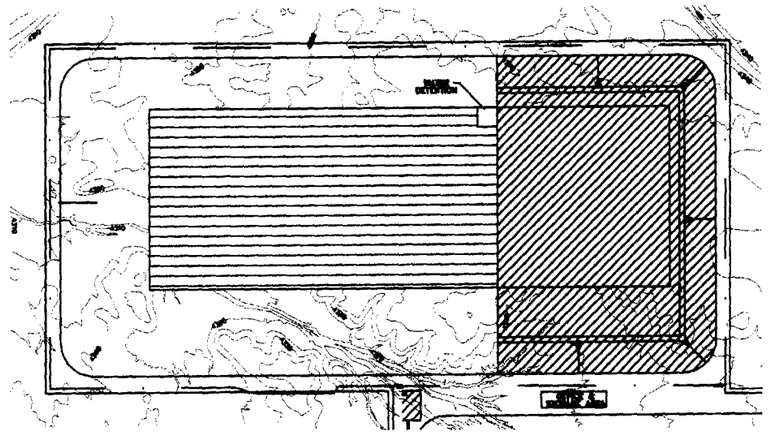

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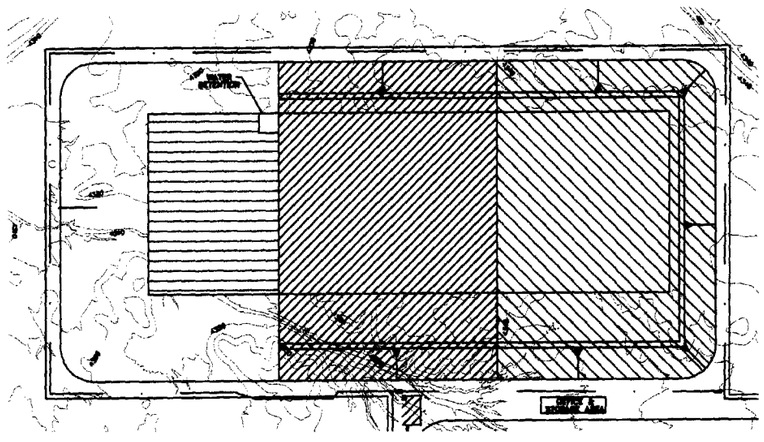

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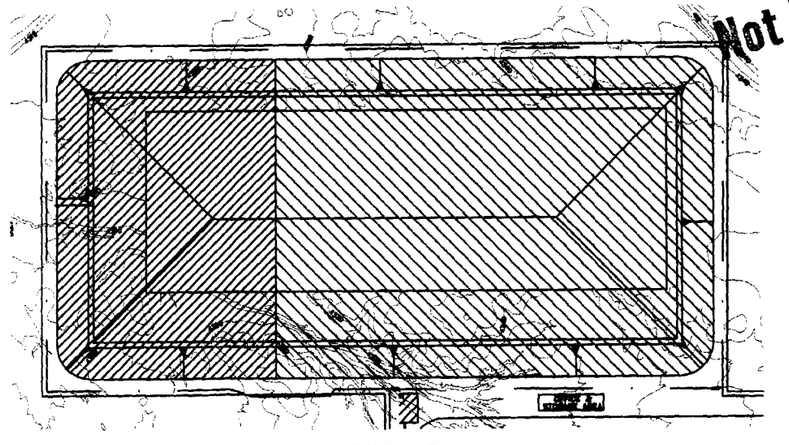
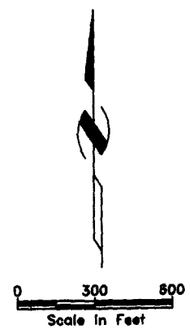


PHASE VI



ACTIVE CELL

FILL TO GROUND SURFACE

FILL TO FINAL COVER

ATC ASSOCIATES INC

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(801) 412-0003

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NOTES:
1.

LICENSED PROFESSIONAL ENGINEER
No. 186632
KEVIN B. COSPER
STATE OF UTAH

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SHEET TITLE

SOLITUDE LANDFILL

CELL II
FILLING SEQUENCE

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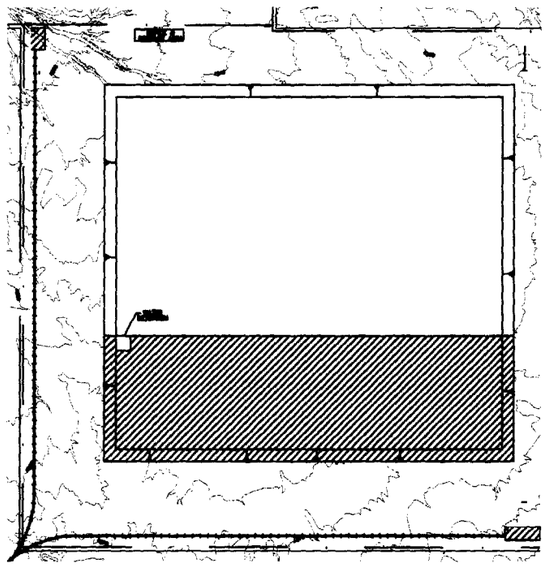
8



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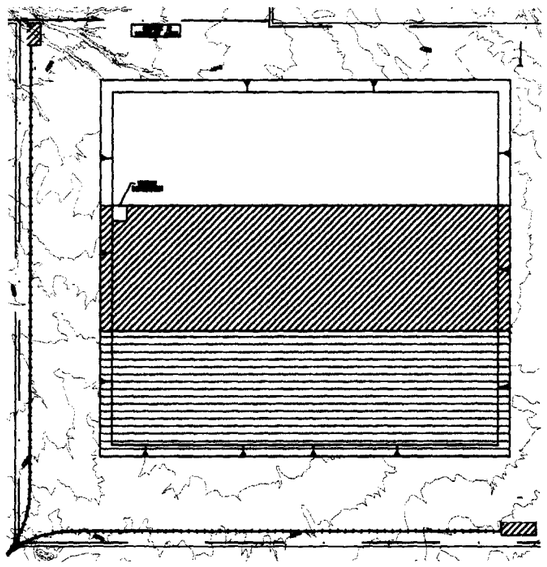

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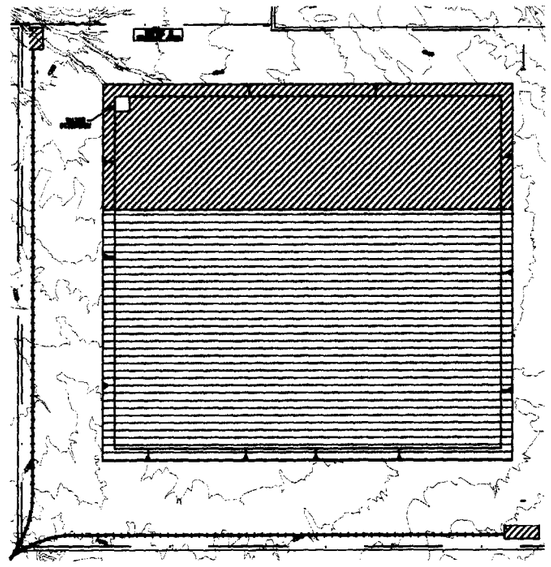

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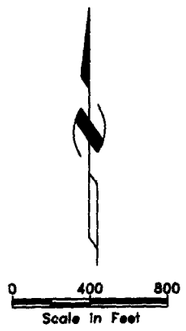
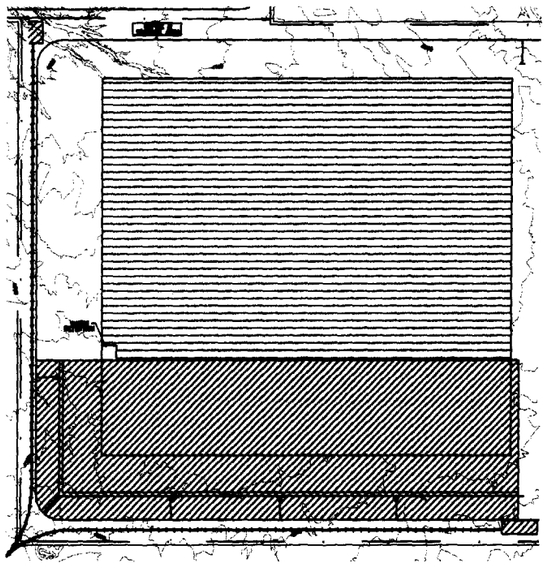


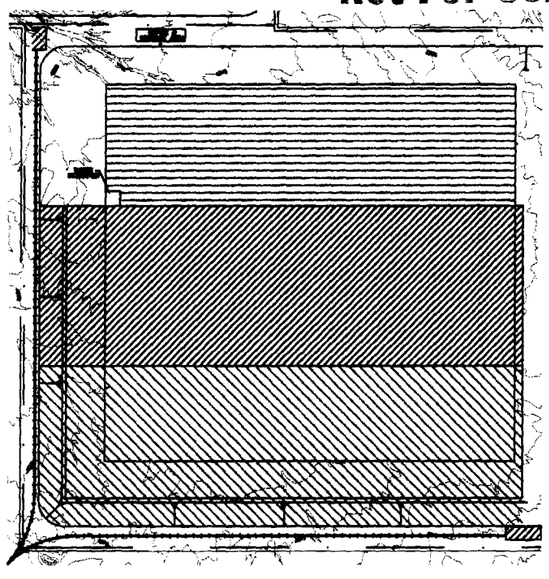
ACTIVE CELL

FILL TO GROUND SURFACE

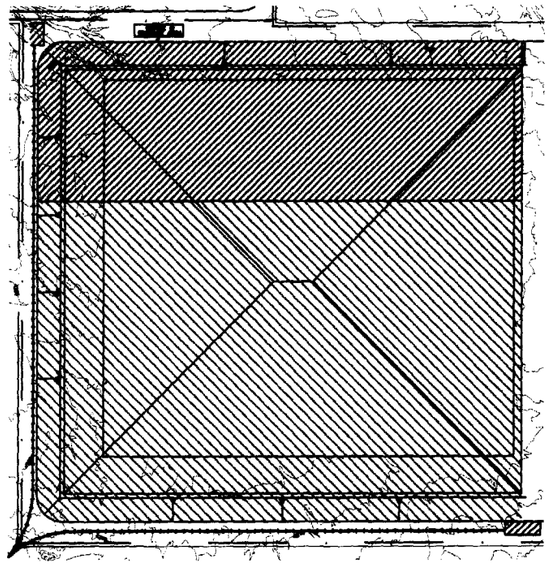
FILL TO FINAL COVER



PHASE IV



PHASE V



PHASE VI

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NOTES:
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STATE OF UTAH

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CHECKED BY:

SHEET TITLE

SOLITUDE LANDFILL

CELL #2
FILLING SEQUENCE

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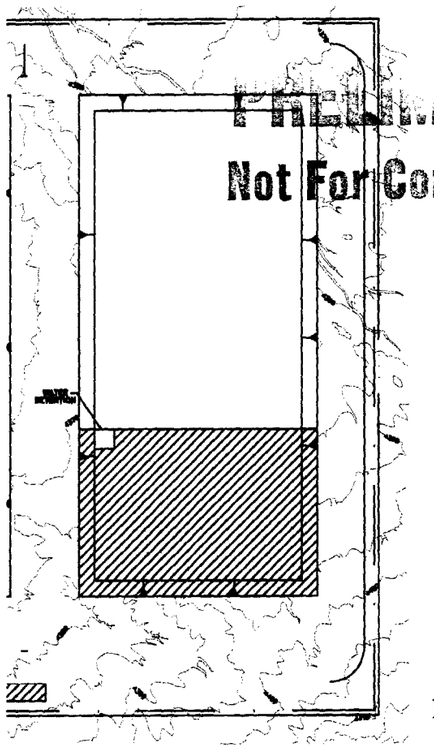
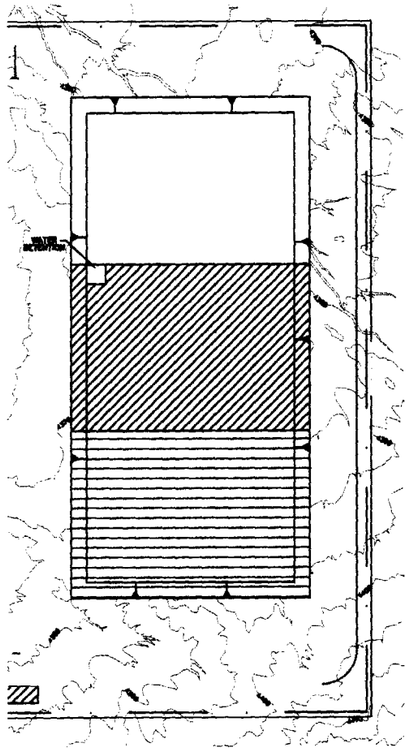
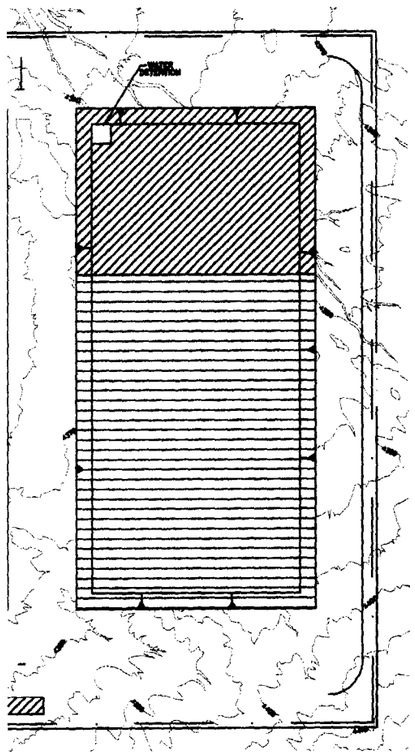


PHASE I



PHASE II



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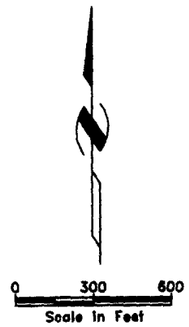

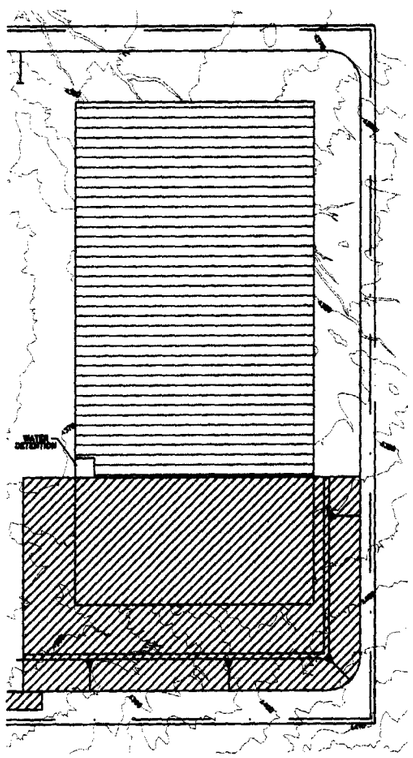

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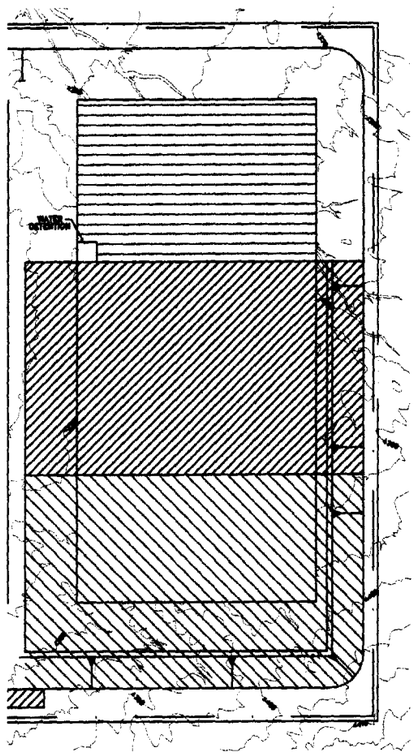

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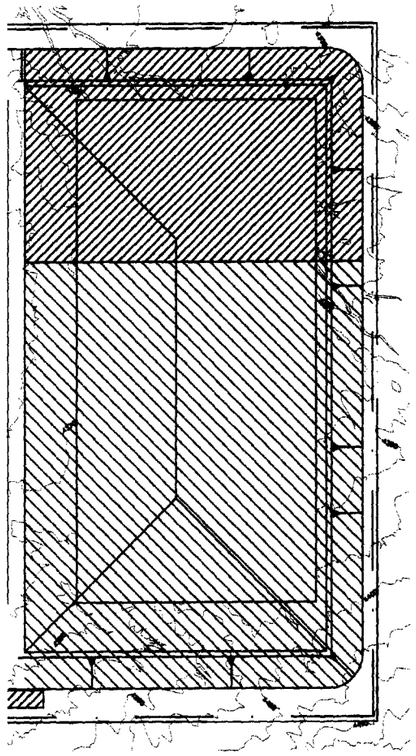

PHASE VI

ACTIVE CELL

FILL TO GROUND SURFACE

FILL TO FINAL COVER

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Suite 106
Salt Lake City, Ut 84109
(801) 412-0003

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NOTES:
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LICENSED PROFESSIONAL ENGINEER
No. 186632
KEVIN B. COSPER
STATE OF UTAH

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CHECKED BY:

SHEET TITLE

SOLITUDE LANDFILL

CELL #3 FILLING SEQUENCE

FOR REVIEW ONLY
PURPOSES ONLY
NOT FOR CONSTRUCTION

10

E 456032 B 0574 P 330 - 331
Date 7-JAN-2002 16:19pm
Fee: 12.00 Check
MERLENE MOSHER, Recorder
Filed By VAR
For TRAVIS BOWEN
GRAND COUNTY CORPORATION

Send Recorded Deed To:
Law Office of Travis L. Bowen, P.C.
P. O. Box 11637
Salt Lake City, UT 84147-0637

Mail Tax Notice To:
Green River Landfill, L.L.C.
4570 Westgrove Suite 240
Addison, Texas 75001

S.E.U.T.CO.
Accommodation Recording
Not Examined

Property Identified As: 320 Acres unimproved property located within Grand County, Utah

QUIT-CLAIM DEED

For Value Received, Green River Ltd., a chartered Corporation of the Commonwealth of the Bahamas, hereinafter called the Grantor, hereby quitclaims unto Green River Landfill, L.L.C., a Utah limited liability company, hereinafter called the Grantee, the following premises, in the County of Grand, State of Utah to-wit:

The North half of the Northwest quarter, the Southeast quarter of the Northwest quarter, the South half of the Northeast quarter, the Northeast quarter of the Southwest quarter, and the North half of the Southeast quarter of Section 22, Township 21 South, Range 17 East, Salt Lake Base and Meridian, together with all mineral, oil and gas rights, said rights and reservations not being subject to the following:

Subject to City and/or County taxes and Assessments, not delinquent, Easements, Rights-Of-Way, Covenants, Conditions and Restrictions now of record.

To have and to hold the said premises, with their appurtenances, unto said Grantee and the Grantee's assigns forever.

Dated this 10th day of April, 1998.

GREEN RIVER LTD.

Rick Redle

Rick Redle, Trustee

011300

STATE OF Texas)
: ss.
COUNTY OF Dallas)

On this 30th day of November, 20 01, before me, a Notary Public in and for said State, personally appeared, Rick Redle, Trustee, known to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that the same was executed.

ROXIE HEBERT
Notary Public, State of Texas
My Commission Expires
February 06, 2005

Roxie Hebert
Notary

SOLITUDE LANDFILL
GENERAL INSPECTION FORM

Date: _____

Time: _____

Inspector: _____ _____
Printed Name Signature

Condition of Roadway: _____

_____

Condition of Gate & Entry: _____

_____

Condition of Fence: _____

_____

Condition of Run-on / Run-off Controls: _____

_____

Other Items: _____

_____

Recommended Actions: _____

_____

_____

_____

WASTE INSPECTION REPORT

Operator: _____ Date: _____ Time: _____

Generator: _____ Vehicle Type & ID: _____

Net Wt or Volume: _____ tons ☐ cubic yards ☐

Driver Name: _____

Load Description: _____

Types of Waste:

Household ☐	Commercial ☐	Industrial ☐
Ash ☐	Soil ☐	C&D ☐
Asbestos ☐	Tires ☐	Animals ☐
Sealed containers ☐		Free Liquid ☐
Contained gas ☐		

RCRA Hazwaste ☐ Describe: _____

INSPECTION RESULTS: LOAD ACCEPTED ☐

LOAD REJECTED ☐

IF REJECTED, NOTIFY DEQ AND GENERATOR.

Date and time DEQ notified: _____

Date and time Generator notified: _____

INSPECTOR'S SIGNATURE: _____

MUNICIPAL WASTE FLOW RECORD

CELL NO. _____

DATE:_____

TIME	GENERATOR	MSW ☑	OTHER (describe)	VEHICLE TYPE	WEIGHT

DAILY OPERATING RECORD

DEVIATIONS FROM PLAN OF OPERATION

DATE: _____

This Record is to be used to note operations and operational systems that deviate from the Plan of Operation. Note time, condition that required deviation from Plan of Operation, and action taken. Sign or initial all entries.

RECORD OF PERSONNEL TRAINING

Name: _____

Title / Position: _____

Hire Date: _____ Supervisor: _____

Initial Training Date: _____ Trainer: _____

Material Covered: _____

_____

_____

Type of Training: ☐ OJT ☐ Classroom ☐ Seminar

☐ Other: _____

Verification / Certificate / Record in File? ☐ YES ☐ NO

☐ ANNUAL TRAINING ☐ OTHER: _____

Date: _____ Trainer: _____

Material Covered: _____

_____

Type of Training: ☐ OJT ☐ Classroom ☐ Seminar

☐ Other: _____

Verification / Certificate / Record in File? ☐ YES ☐ NO

☐ ANNUAL TRAINING ☐ OTHER: _____

Date: _____ Trainer: _____

Material Covered: _____

_____

Type of Training: ☐ OJT ☐ Classroom ☐ Seminar

☐ Other: _____

Verification / Certificate / Record in File? ☐ YES ☐ NO

☐ ANNUAL TRAINING ☐ OTHER: _____

Date: _____ Trainer: _____

Material Covered: _____

_____

Type of Training: ☐ OJT ☐ Classroom ☐ Seminar

☐ Other: _____

Verification / Certificate / Record in File? ☐ YES ☐ NO

☐ ANNUAL TRAINING ☐ OTHER: _____

Date: _____ Trainer: _____

Material Covered: _____

_____

Type of Training: ☐ OJT ☐ Classroom ☐ Seminar

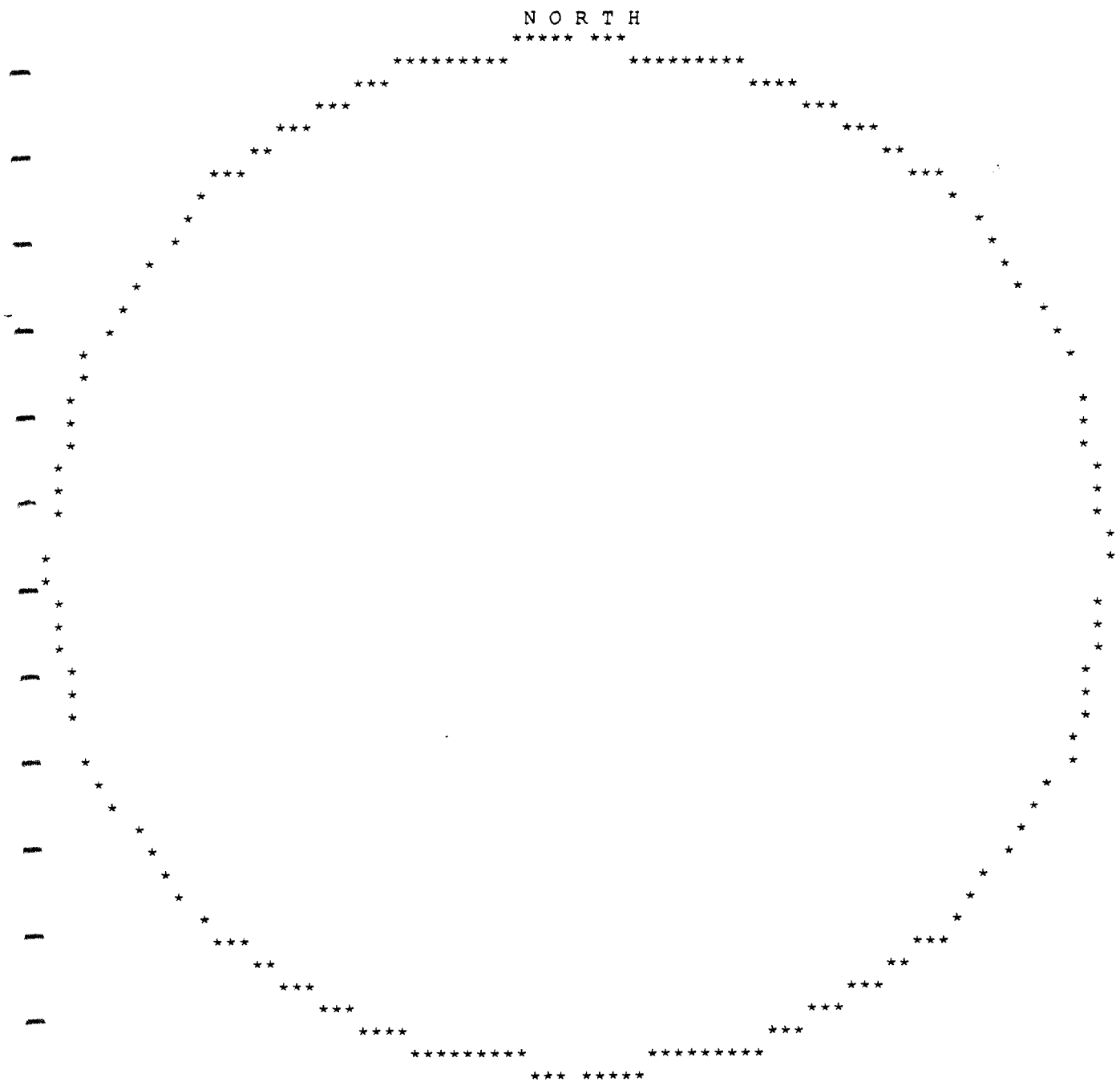
☐ Other: _____

Verification / Certificate / Record in File? ☐ YES ☐ NO

UTAH DIVISION OF WATER RIGHTS
WATER RIGHT POINT OF DIVERSION PLOT CREATED TUE, FEB 12, 2002, 1
PLOT SHOWS LOCATION OF 0 POINTS OF DIVERSION

PLOT OF AN AREA WITH A RADIUS OF 11000 FEET FROM A POI
S 2640 FEET, E 2640 FEET OF THE NW CORNER,
SECTION 22 TOWNSHIP 21S RANGE 17E SL BASE AND MERIDI

PLOT SCALE IS APPROXIMATELY 1 INCH = 4000 FEET



UTAH DIVISION OF WATER RIGHTS

POUINFO Place of Use Listing

Version: 2001.06.28.00 **Rundate: 02/12/2002 10:44 AM**

WATER RIGHTS (PLACE OF USE) in: Township 21S Range 17E SL Base & Meridian

(The Division of Water Rights makes NO claims regarding the accuracy of this data!!

POD: Point of Diversion ----S=Surface, U=Underground, P=Point to Point
ST/TOR: Status/Type of Right
TYPE: Type of Place of Use---I=Irrigated Acreage, P=Other Place of Use
USES: I=Irrigation, S=Stockwatering, D=Domestic, Mu=Municipal, Mi=Mining, P=Pow

			NW4	*	NE4	*	SW4	*	SE4
WR-CH-EX#	POD	ST/TOR	TYPE	WATER USES	N N S S W E W E	*	N N S S W E W E	*	N N S S W E W E	*	N N S S W E W E	*	N N S S W E W E

FIELD PROGRAM

INTRODUCTION

Green River Landfill, L.L.C. (GRL) has investigated an area for a proposed landfill located approximately 7 miles east of Green River, Utah. The landfill area consists of 320 acres located in Section 22, Township 21 South, Range 17 East in Grand County, Utah.

Bingham Environmental, Inc. (Bingham) was retained by GRL to conduct a field investigation at the site to determine the physical and hydrogeological characteristics at the site. Field work was conducted during June and July, 1994. Bingham geologists and/or engineers supervised all field activities. The investigation consisted of the following tasks:

- Aerial Photography to produce a detailed topographic map
- Excavate 18 test pits with a track-mounted backhoe
- Drill 11 exploratory drill holes
- Install 2 piezometers
- Install 7 monitor wells
- Sample 2 monitor wells and 2 piezometers where perched water was encountered
- Perform slug tests on 2 wells

AERIAL PHOTOGRAPHY

Aerial targets were set up and surveyed by Bingham Engineering, Inc. on June 17, 1994, based on limited existing control points. Target locations are shown on the topographic site map (Figure 1). Olympus (Olympus) Aerial Surveys flew over and photographed the site on June 22, 1994. Olympus then produced the detailed topographic map from the aerial photography. The topographic map in Figure 1 is based on 5-foot contours and identified the access road across the site and the existing drainage across the site.

TEST PITS

A Bantam 266 track-mounted backhoe was used to excavate 18 test pits (TP-1 through TP-18) at the locations shown on Figure 1. The test pits were excavated to depths ranging from 8 to 17 feet below the ground surface and logs are included in Attachment 1. In general, the test pits encountered 1 to 3 feet of soil, generally consisting of silt or sandy silt, underlain by weathered shale. One notable exception to this lithology was encountered in TP-18, which had sand, gravel and cobbles to a depth of 12 feet, where the shale bedrock was then encountered. The shale became more competent with

depth, with excavation unable to extend below 8 and 17 feet. Bedding thickness ranged from less than 1 inch to about 4 inches. Grab samples, as indicated on the logs, were collected for laboratory testing from each of the test pits.

EXPLORATORY BORINGS

A CME 75 truck-mounted drill rig was used to drill 15 exploratory borings between June 20 and July 22, 1994. A Bingham hydrogeologist and/or engineer supervised the drilling operations during the duration of the drilling program. They located the holes, logged the subsurface soil and bedrock encountered and obtained relatively undisturbed and disturbed soil and bedrock samples. The majority of the soil samples were obtained by driving a standard penetration sampler (SPT) 18 inches. Relatively undisturbed soil samples were obtained using thin walled steel samplers (Shelby tubes) or a 24 inch long California split barrel sampler with 1.5-inch diameter by 4 inch long brass liners. All of the soil samples are recorded on the drill hole logs included in this attachment.

The holes were drilled with 8.25-inch diameter hollow stem augers from the surface generally to a depth of 14 to 19 feet, where they met refusal within the shale bedrock. The borings were then continued by coring to the desired depth (35 to 140 feet) using a carbide coring bit. Cores were recovered and logged from each hole. Competent bedrock (defined for this site as unbroken core lengths at least 12 inches or greater) was generally encountered at a depth of about 26 feet in the borings.

Perched water was encountered in four of the thirteen borings (DH-2, DH-5, DH-7, and DH-10) at depths ranging from 26 to 38 feet below the ground surface. Temporary piezometers were installed in DH-2, DH-7, and DH-10 using 2-inch hand-slotted and blank PVC pipe. DH-7 was later converted into a monitor well, but DH-2 and DH-10 remain as piezometers.

PERCHED WATER MONITOR WELLS

Seven of the fifteen borings were converted into groundwater monitor wells, completed to depths of between 50 and 100 feet. These include MW-2, MW-4, MW-5, MW-7, MW-7A, MW-13, and MW-14. Monitor well completion was accomplished with the installation of 2-inch diameter flush-coupled schedule 40 PVC pipe with 0.020-inch machine slotted screen in the bottom 60 to 80 feet, with the exception of MW-7A, which was screened in the bottom 27 feet. The annulus was backfilled with #10-20 Colorado silica sand to a minimum height of 2 feet above the screened interval. A bentonite pellet plug a minimum of two (2) feet thick was placed over the sand filter. The remaining annulus was backfilled with a cement-bentonite slurry. A protective concrete pad and locking steel casing were constructed at the surface of the monitor wells. Well completion details are included on the boring logs in this attachment.

Only two of the fifteen wells (MW-2 and MW-5) and the two piezometers currently have water. MW-7, when drilled and completed as a piezometer (DH-7) at a depth of 50 feet, contained water at a static level of 32 feet. The water disappeared after a monitor well was completed in the same hole to a depth of 85 feet. Another well (MW-7A) was installed 15 feet away to a depth of 45 feet; to date, no water has collected in this well either. This is indicative of the localized nature of the perched water.

Water levels have been measured in the existing monitor wells and piezometers throughout the field program. Water level measurements were determined using an electronic well probe. Each measurement is referenced to the top of the PVC casing (TOC) which was surveyed so that perched water elevations could be determined. The monitor well and piezometer water level elevations are tabulated in a table in this attachment. (Based on our investigation and analysis of water samples, we believe the water encounter in the wells is perched water which percolates from ? streams, which is not considered a consistent or viable aquifer.)

PERCHED WATER SAMPLING

The monitor wells were developed immediately after installation and then allowed to stabilize for several days before sampling, which was performed on July 29, 1994. Prior to sampling the water level was measured, and a minimum of three casing volumes of water were removed from each well using disposable polyethylene bailers. Specific conductance, temperature and pH were monitored during the bailing and a final reading was obtained prior to the sample collection. After the purging was completed the water level was allowed to return to approximately its original level and samples were obtained using polyethylene bailers.

Sample labels were filled out and attached to the sample bottles and the samples were stored on ice in coolers until the samples were delivered to the analytical laboratory. The samples were sent to the laboratory under chain of custody.

SLUG TESTS

Slug injection tests were performed on two (2) monitor wells identified as MW-2 and MW-5, on July 29, 1994 to estimate horizontal hydraulic conductivity values for the fractured bedrock. Each test consisted of injecting a known volume of previously bailed water back into the monitor well as rapidly as possible, and then measuring the depth to water as the water level dropped back to its original static level.

The tests were performed using automatic water level monitoring and logging equipment which provided accurate water level measurements during the recovery phase. The data was analyzed

using methods developed by Hvorslev (1951). Results of the tests have been tabulated and plotted and are included along with a summary of the estimated hydraulic conductivity values in this attachment.

SURVEYING

Bingham performed surveying of all monitor well, piezometer, exploratory drill hole, and test pit locations at the site, as part of the field program. The surveying included determining the horizontal coordinates and vertical elevations of these points. All vertical control was based on the USGS benchmark A-16 located approximately 1 mile from the site. The horizontal control was based on the USGS Utah Green River NE 7½ minute topographic quadrangle. The survey data is summarized in a table in this attachment.

LABORATORY TESTING AND ANALYSIS

GEOTECHNICAL LABORATORY TESTING

Selected samples were submitted to Bingham Engineering's materials testing laboratory for the following tests: moisture content, unit weight, grain size analysis, hydrometer, Atterberg limits, and permeability. The results of the tests are included within this attachment.

Atterberg Limits

Atterberg limits (which include the liquid and plastic limits) determinations were performed as an index to soil behavior, to aid in correlating various other test data and to aid in classifying samples.

Grain Size Analysis and Hydrometer

Standard mechanical grain size analysis was performed on selected soil samples obtained in conjunction with the field investigations. The test procedures consisted of washing a representative portion of each sample through a No. 200 sieve and recording the percent dry weight of the material passing the No. 200 sieve. Then the remaining sample, retained above the No. 200 sieve, was evaluated by a mechanical method to determine the percent by dry weight retained on selected sieve sizes. The material passing the 200 sieve was then further analyzed using a hydrometer for some of the samples.

Moisture Content and Unit Weight Determinations

Moisture content and density determinations were performed in order to aid in classifying materials and to correlate with other hydrogeologic properties.

Compaction Testing

Compaction tests were performed on two representative composite samples to determine the maximum dry density and optimum moisture content. The tests were performed in accordance with the ASTM D-698 Method of Compaction.

Permeability

Permeability testing was performed on three separate samples collected from overburden material at the site. The first test was performed on an uncompacted soil sample (TP-1, CA-2)

to determine natural infiltration rates of precipitation into the underlying shale bedrock. The other two tests were performed on compacted soil samples which were compacted to 98% of maximum dry density as determined by the standard Proctor. Information regarding the specific soil samples comprising Composite #1 and Composite #2 is given in the Permeability Test Results table presented in Attachment 1.

Triaxial Testing

Two composite samples (Composite #1 and Composite #2) were submitted for triaxial consolidated undrained with pore pressure testing. The results are included in this section.

Swelling Potential

Because the embankments of the landfill cells are to be constructed with excavated Mancos Shale material, laboratory testing was performed on soil and gravel size shale samples from the Green River Landfill site to determine the swelling potential the material would exhibit when wetted. The procedure used is as follows:

1) Specimens of gravel sized shale particles and weathered shale (soil) are placed in the consolidometer at natural moisture content, loaded in the normal manner to some preselected load, and allowed to come to equilibrium;

2) immerse the sample and observe the height increase until equilibrium is reached;

3) reduce the vertical pressure by a factor of two and observe the associated swell;

4) repeat step (3) until loading is removed;

5) plot the curve representing swelling pressure versus percent expansion.

The results of the testing are included on the attached graphs. The testing indicates that only slight to moderate swell characteristics were observed; a maximum of 1.12% under a loading of 130 pounds per square foot. Given a density of 110 pounds per cubic foot (pcf) for the shale at the site, this loading corresponds to a shallow depth of confinement of 0.12 feet. A swell of 1.12% would be equivalent to 0.02 inches.

The results indicate that the gravel sized shale and the soil are very similar in their swelling potential. Weathering of the shale is not expected to have an adverse effect on the stability of the embankments or the cover system.

CHEMICAL LABORATORY ANALYSIS

Perched water samples were submitted to American West Analytical Laboratory for chemical analysis. The results are included in this attachment and are summarized in Table 1 located after the text of the Hydrogeologic Report.

Field Quality Assurance/Quality Control

Sample Preservation - All samples were placed in Class A environmental containers provided by American West Analytical Laboratory (AWAL) with proper preservatives. The samples were stored in a cooler at 4°C until hand delivered to AWAL for analysis.

Chain of Custody - Samples selected to be sent to AWAL for analysis were hand delivered under strict chain of custody protocol.

Field Analysis Validation - Field analysis for the indicator parameters of conductivity and pH were compared to a certified laboratory analysis and the results compared very well.

Laboratory Quality Assurance/Quality Control

Field Duplicate - A field duplicate was collected from MW-5 and submitted to AWAL under the blind sample identification of MW-1.

SUMMARY OF WELL, EXPLORATORY HOLE AND TEST PIT LOCATION AND ELEVATIONS
GREEN RIVER LANDFILL

DRILL HOLE ID	PROJECT COORDINATES		ELEV. GROUND SURFACE (feet)	ELEV. TOP PROTECTIVE CASING WITH LID (feet)	ELEV. TO OF PVC W/O CAP (feet)	TEMP BENCH MARK (feet)
	Northing (feet)	Easting (feet)				
DH-1	12768.8	1557.1	4313.1	NA	NA	NA
DH-2	12753.5	4082.5	4340.5	NA	4345.28	NA
DH-3	12159.5	2840.0	4333.4	NA	NA	NA
DH-6	11474.3	4140.6	4343.5	NA	NA	NA
DH-8	11445.7	6765.2	4371.6	NA	NA	NA
DH-9	10142.4	3343.0	4348.6	NA	NA	NA
DH-10	10183.3	4374.3	4352.5	NA	4353.83	NA
DH-12	10155.9	6113.2	4377.5	NA	NA	NA
DH-15	8865.9	6768.1	4406.8	NA	NA	NA
MW-2	12778.4	4110.8	NA	4341.39	4341.30	4338.96
MW-4	11489.8	1557.5	4318.5	4321.51	4321.46	NA
MW-5	11452.7	2865.2	NA	4328.51	4328.29	4326.85
MW-7	11447.3	4701.7	4355.8	4358.71	4358.65	NA
MW-7A	11443.7	4716.4	4355.8	4358.75	4358.67	NA
MW-13	8891.7	2912.2	4372.2	4375.22	4375.10	NA
MW-14	8849.3	4187.8	4369.9	4372.81	4372.77	NA
TP-1	11811.7	1900.4	4327.0	NA	NA	NA
TP-2	11577.2	1937.8	4319.9	NA	NA	NA
TP-3	11018.8	2920.4	4331.3	NA	NA	NA
TP-4	10793.8	3437.4	4342.8	NA	NA	NA
TP-5	10161.2	3599.7	4347.8	NA	NA	NA
TP-6	9695.2	4226.9	4356.6	NA	NA	NA
TP-7	9345.4	3623.7	4361.0	NA	NA	NA
TP-8	9250.6	3372.0	4368.4	NA	NA	NA
TP-9	9216.7	3185.1	4361.9	NA	NA	NA
TP-10	8824.3	5039.5	4384.8	NA	NA	NA
TP-11	8945.1	6244.1	4392.6	NA	NA	NA
TP-12	9291.1	6081.2	4398.4	NA	NA	NA
TP-13	9769.4	5711.6	4372.1	NA	NA	NA
TP-14	9411.9	5261.0	4367.5	NA	NA	NA
TP-15	10522.3	5700.1	4372.5	NA	NA	NA
TP-16	10720.2	4411.7	4347.9	NA	NA	NA
TP-17	11520.7	3466.5	4332.7	NA	NA	NA
TP-18	11809.8	3223.7	4347.4	NA	NA	NA

NA - Not Available or Applicable

11/21/94

PERCHED WATER LEVEL MEASUREMENTS
GREEN RIVER LANDFILL

WELL ID #	Depth to water from top of PVC casing (feet)	GRDWTR SURFACE ELEVATION (feet)	Depth to water from top of PVC casing (feet)	GRDWTR SURFACE ELEVATION (feet)	Depth to water from top of PVC casing (feet)	GRDWTR SURFACE ELEVATION (feet)	Depth to water from top of PVC casing (feet)	GRDWTR SURFACE ELEVATION (feet)	Depth to water from top of PVC casing (feet)	GRDWTR SURFACE ELEVATION (feet)
	July 14, 1994		July 19, 1994		July 22, 1994		July 28, 1994		November 18, 1994	
DH-2	29.97	4315.31	28.06	4317.22	27.46	4317.82	26.72	4318.56	29.48	4315.80
MW-2	27.98	4313.32	26.20	4315.10	25.75	4315.55	25.04	4316.26	25.50	4315.80
MW-4	NA	NA	NA	NA	DRY	DRY	DRY	DRY	DRY	DRY
MW-5	29.96	4298.33	30.68	4297.61	31.05	4297.24	31.67	4296.62	32.21	4296.08
MW-7	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-7A	NA	NA	NA	NA	NA	NA	DRY	DRY	DRY	DRY
DH-10	37.68	4316.15	37.52	4316.31	37.42	4316.41	37.57	4316.26	39.05	4314.78
MW-13	DRY	DRY	NA	NA	DRY	DRY	DRY	DRY	DRY	DRY
MW-14	NA	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY

11/21/94

NA Not measured

SUMMARY OF SLUG INJECTION TESTS
GREEN RIVER LANDFILL

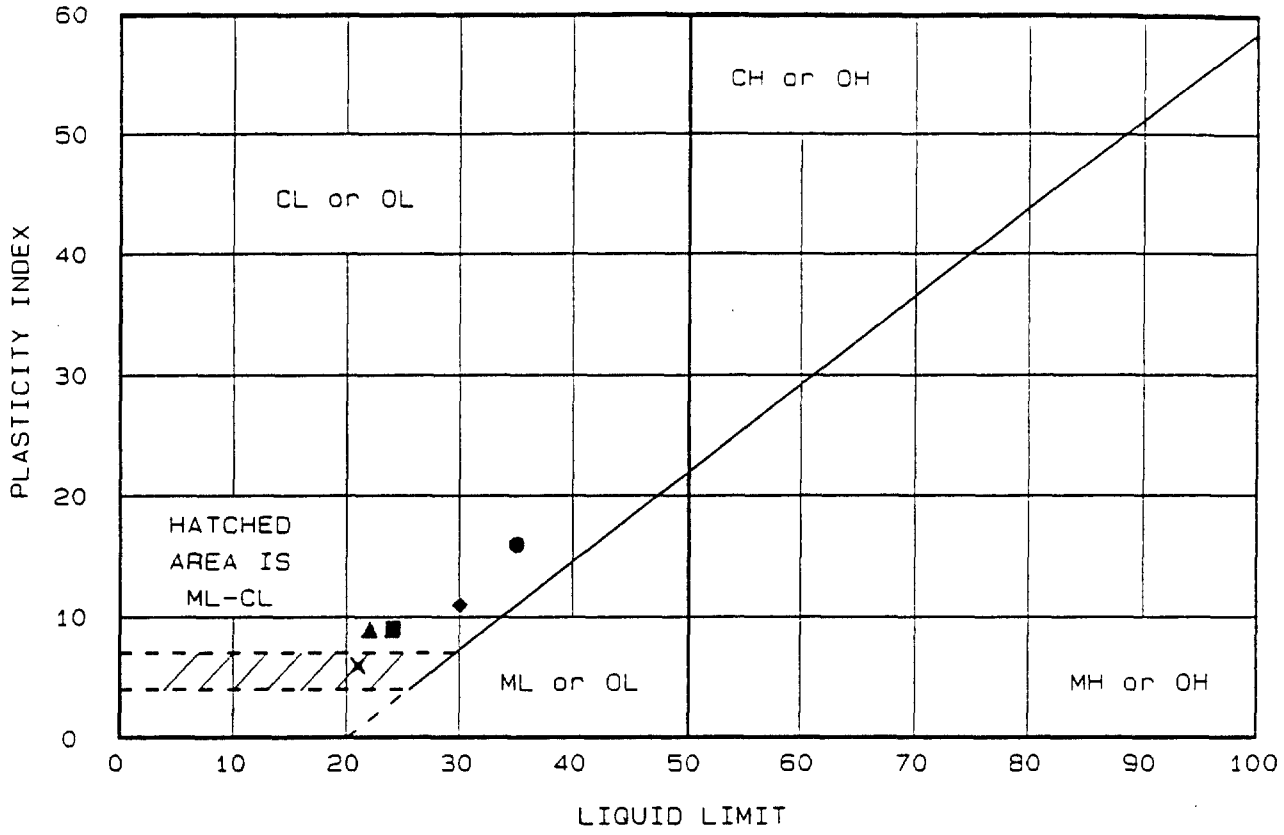
Well I.D.	Screen Length (feet)	Effective Aquifer Length (feet)	Volume of Water Injected (gallons)	Calculated Ho (feet)	Hydraulic Conductivity (cm/sec)	Analysis Method
MW-2	75.0	75.0	2.6	15.93	7.6E-05	1
MW-5	60.0	60.0	0.84	5.15	2.1E-05	1

10/14/94

Analysis Methods:

1. Hvorslev
2. Cooper-Bredehoeft-Papadopulos
3. Ferris-Knowles
4. Bouwer

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-85
●	DH-3, CA-1	35	19	16		
▲	MW-5 S-1	22	13	9		
■	MW-5, CA-2	24	15	9		
◆	DH-6, S-1	30	19	11		
×	DH-8, S-1	21	15	6		

Project No.: 2106-004
Project: Subsurface Investigation

Client: Green River Landfill
Location: Green River

Date: 08-17-94

LIQUID AND PLASTIC LIMITS TEST REPORT

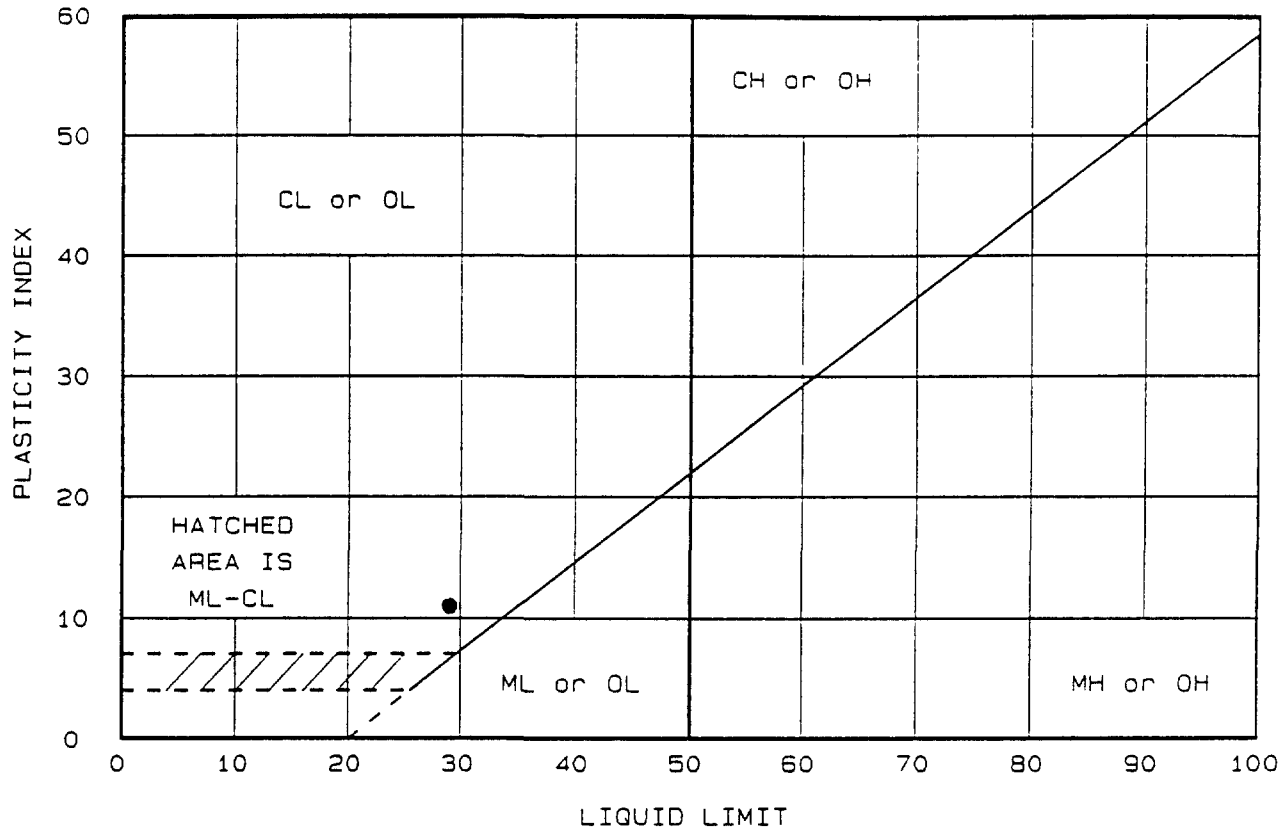
Bingham Engineering

Remarks:

Tested By: BB

Fig. No. _____

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	ASTM D 2487-85
● TP-3, B-1	29	18	11		

Project No.: 2106-004
Project: Subsurface Investigation

Client: Green River Landfill
Location: Green River

Date: 08-17-94

Remarks:

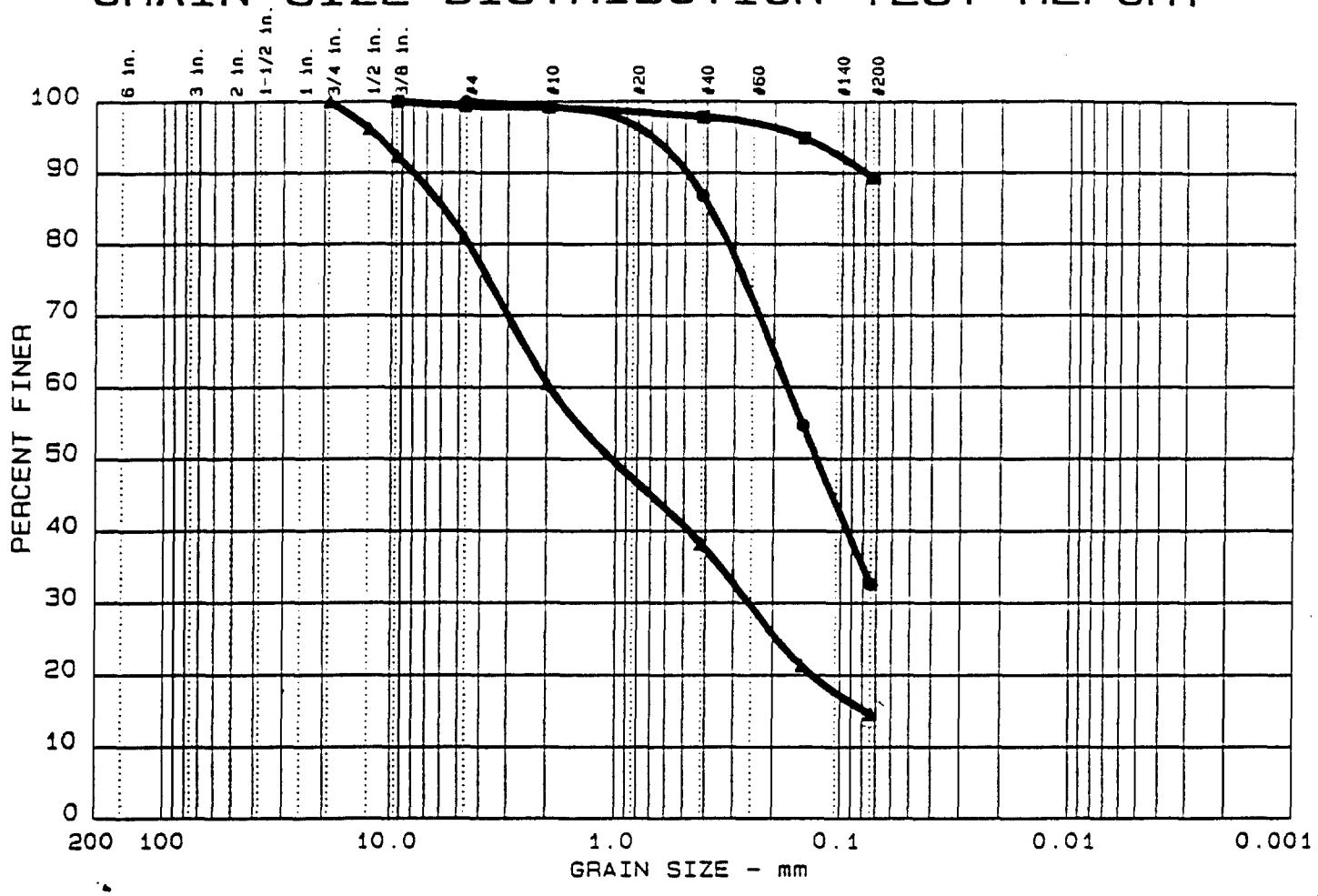
Tested By: BB

LIQUID AND PLASTIC LIMITS TEST REPORT

Bingham Engineering

Fig. No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	67.4	32.6	
▲	0.0	19.2	66.2	14.6	
■	0.0	0.6	10.1	89.3	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.39	0.17	0.13					
▲			5.89	1.95	1.05	0.257	0.0776			
■										

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Clayey Sand	SC	A-2-4
▲ Brown Gravely Clayey Sand	SC	A-1-b
■ Brown Fine Sandy Clay	CL	A-4

Project No.: 2106-004
Project: Green River Landfill
● Location: OH-1, CA-2
▲ Location: OH-1, B-3
■ Location: OH-9, CA-1 Depth 8.0' to 12.0'
Date: 08-17-94

Remarks:

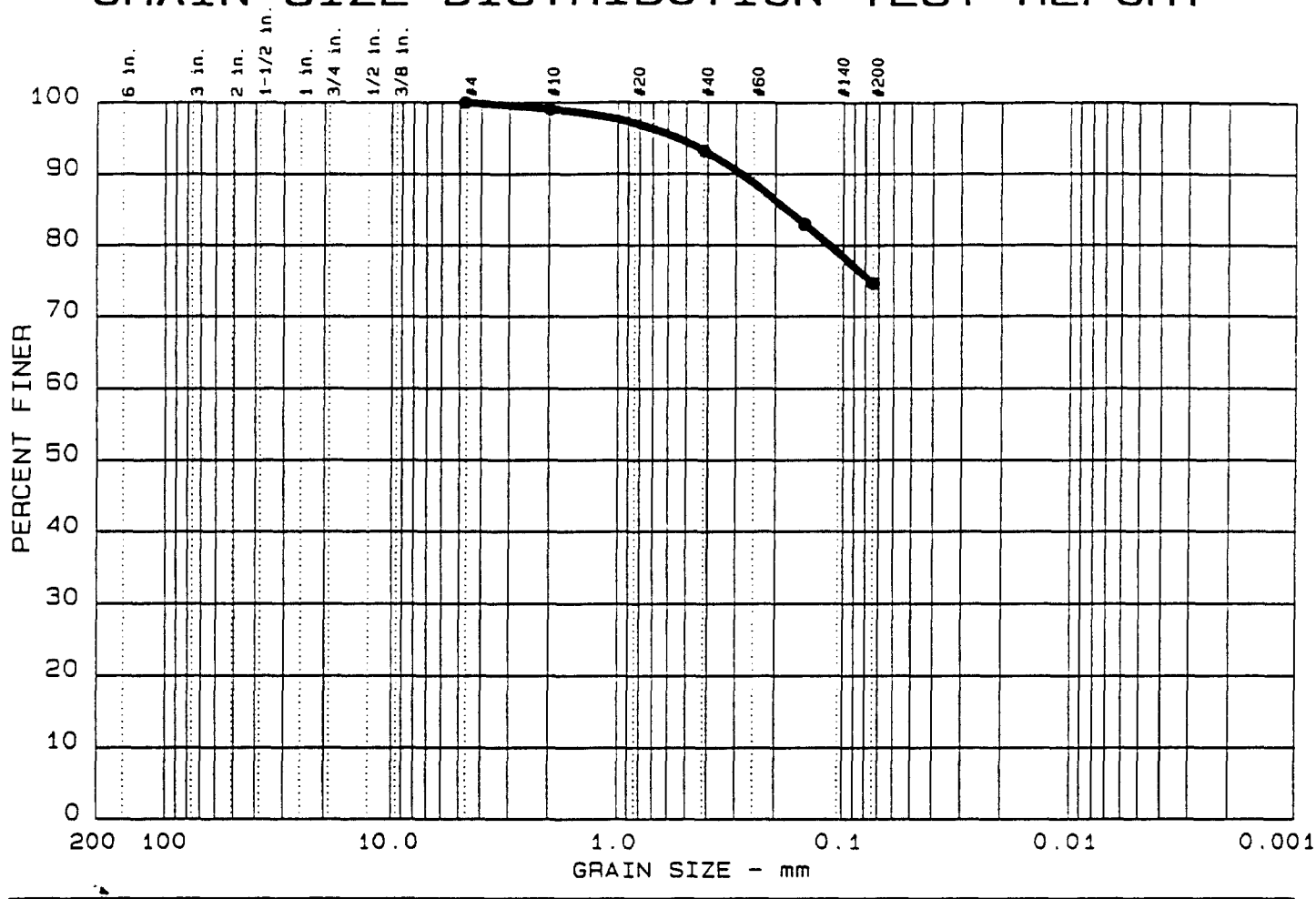
Tested By: DA

GRAIN SIZE DISTRIBUTION TEST REPORT

Bingham Engineering

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	25.4	74.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.18							

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Fine Sandy Clay	CL	A-4

Project No.: 2106-004
Project: Green River Landfill
● Location: OH-12, CA-1 Depth 8.0' to 12.0'

Date: 08-17-94

Remarks:

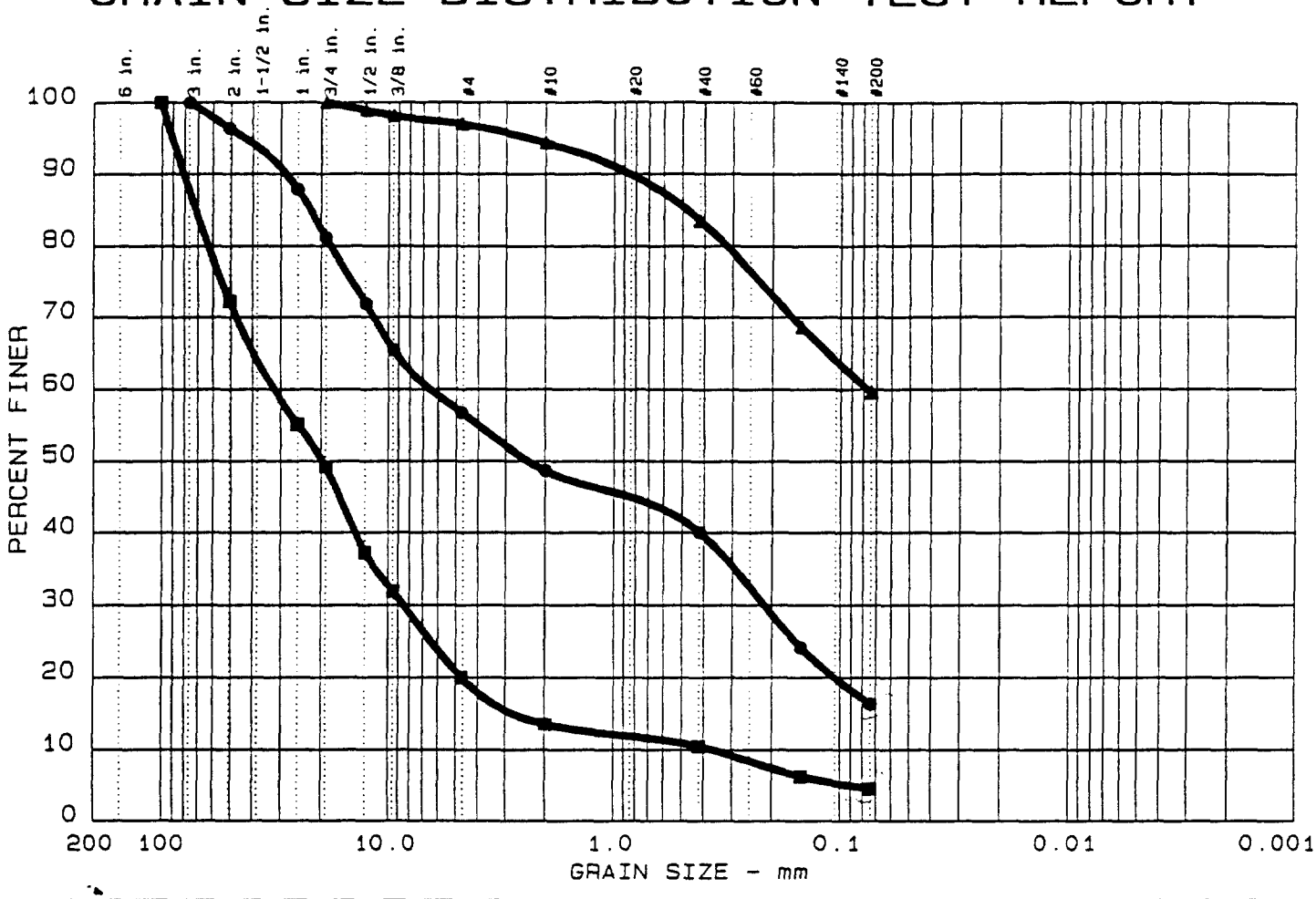
Tested By: JO

GRAIN SIZE DISTRIBUTION TEST REPORT

Bingham Engineering

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	43.3	40.4	16.3	
▲	0.0	3.0	37.5	59.5	
■	12.4	67.6	15.4	4.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	29	11	22.39	6.53	2.37	0.216				
▲			0.48	0.08						
■			71.45	32.28	19.66	8.482	2.7765	0.3660	6.09	88.2

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Sandy Clayey Gravel	GC	A-2-6
▲ Brown Clayey Sand	CL	A-4
■ Brown Sandy Gravel	GP	A-1-a

Project No.: 2106-004
Project: Green River Landfill
● Location: TP-1, B-1 Depth 0' to 3.0'
▲ Location: TP-3, B-1 Depth 0.0' ot 2.5'
■ Location: TP-18, B-1 Depth 0.0' to 12.0'
Date: 08-17-94

Remarks:

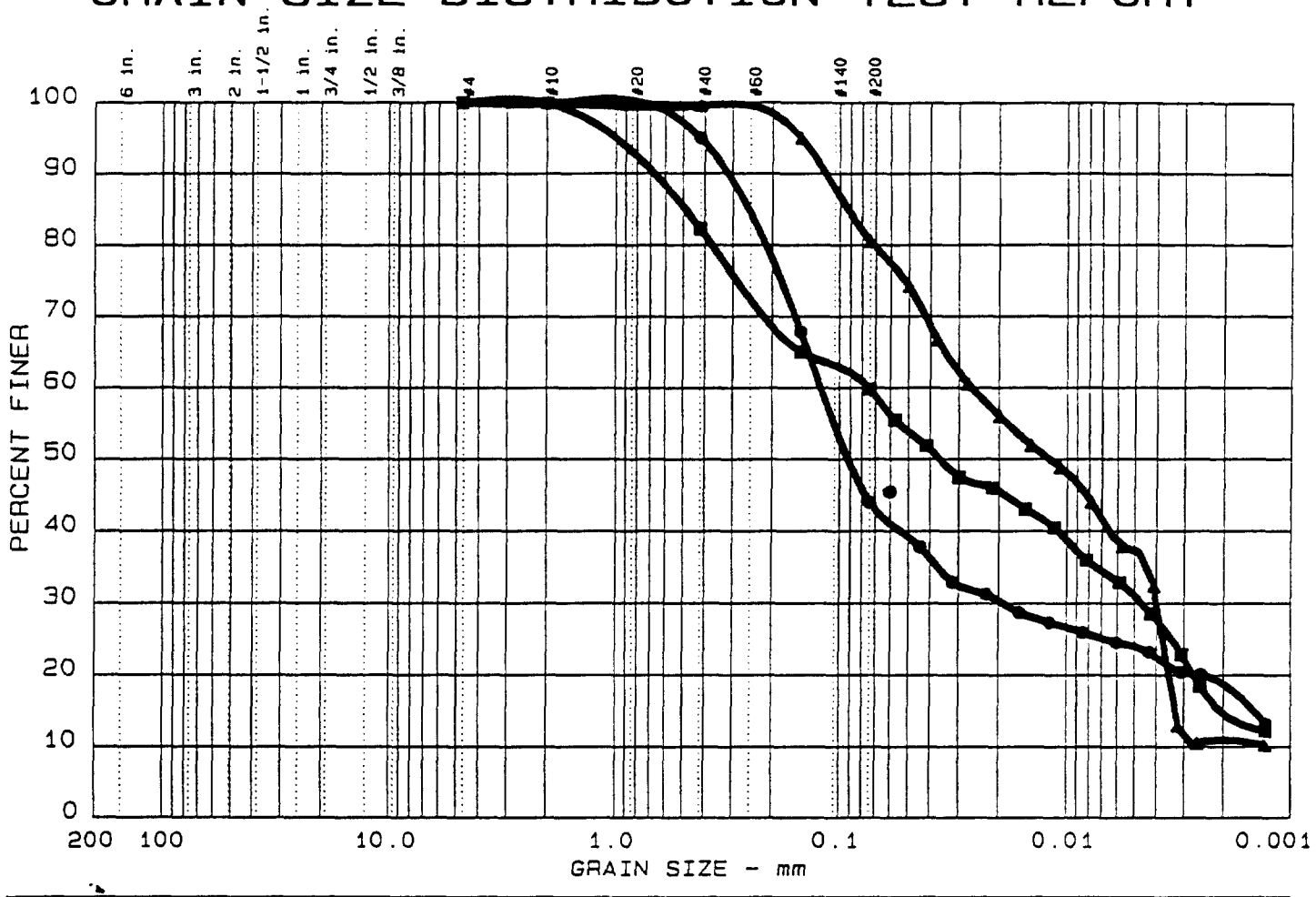
Tested By: JO

GRAIN SIZE DISTRIBUTION TEST REPORT

Bingham Engineering

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	56.0	20.0	24.0
▲	0.0	0.0	19.5	43.0	37.5
■	0.0	0.0	40.1	28.9	31.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.25	0.12	0.09	0.019	0.0015			
▲	24	9	0.09		0.01	0.004	0.0033			
■	30	11	0.49	0.07	0.04	0.005	0.0021			

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Clayey Silty Fine Sand	SC	A-4
▲ Light Tand Fine Sandy Silty Clay	CL	A-4
■ Brown Sandy Silty Clay	CL	A-6

Project No.: 2106-004
Project: Green River Landfill
● Location: DH-2, B-1
▲ Location: MW-5, CA-2 Depth 8.0' to 12.0'
■ Location: DH-6, S-1
Date: 08-17-94

Remarks:

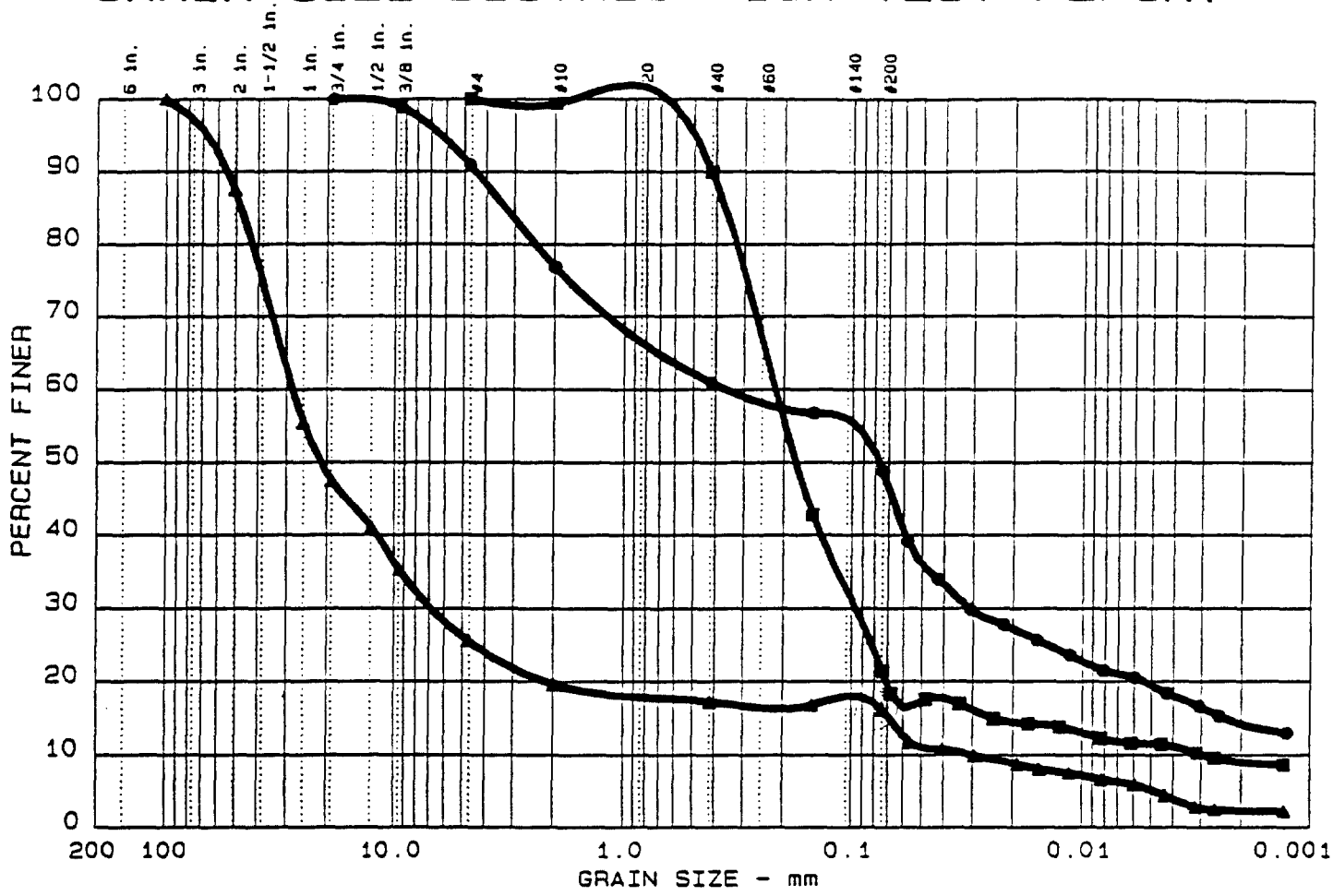
Tested By: DA

GRAIN SIZE DISTRIBUTION TEST REPORT

Bingham Engineering

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	9.1	42.2	29.4	19.3
▲	2.9	71.5	9.5	11.0	5.1
■	0.0	0.0	78.6	9.8	11.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	21	6	3.27	0.36	0.08	0.031	0.0024			
▲			47.53	28.31	21.23	6.871	0.0687	0.0307	54.33	922.6
■			.0.37	0.22	0.18	0.096	0.0248	0.0029	14.42	74.3

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Clayey Silty Sand W/Some Fine Gravel	SC-SM	A-4
▲ Brown Silty Gravel W/Some Sand	GM	A-1-b
■ Brown Clayey Fine Sand	SC	Unclassifie

Project No.: 2106-004
Project: Green River Landfill
● Location: DH-8, S-1
▲ Location: TP-2, B-1
■ Location: DH-1, B-1
Date: 08-17-94

Remarks:

Tested By: DA

GRAIN SIZE DISTRIBUTION TEST REPORT

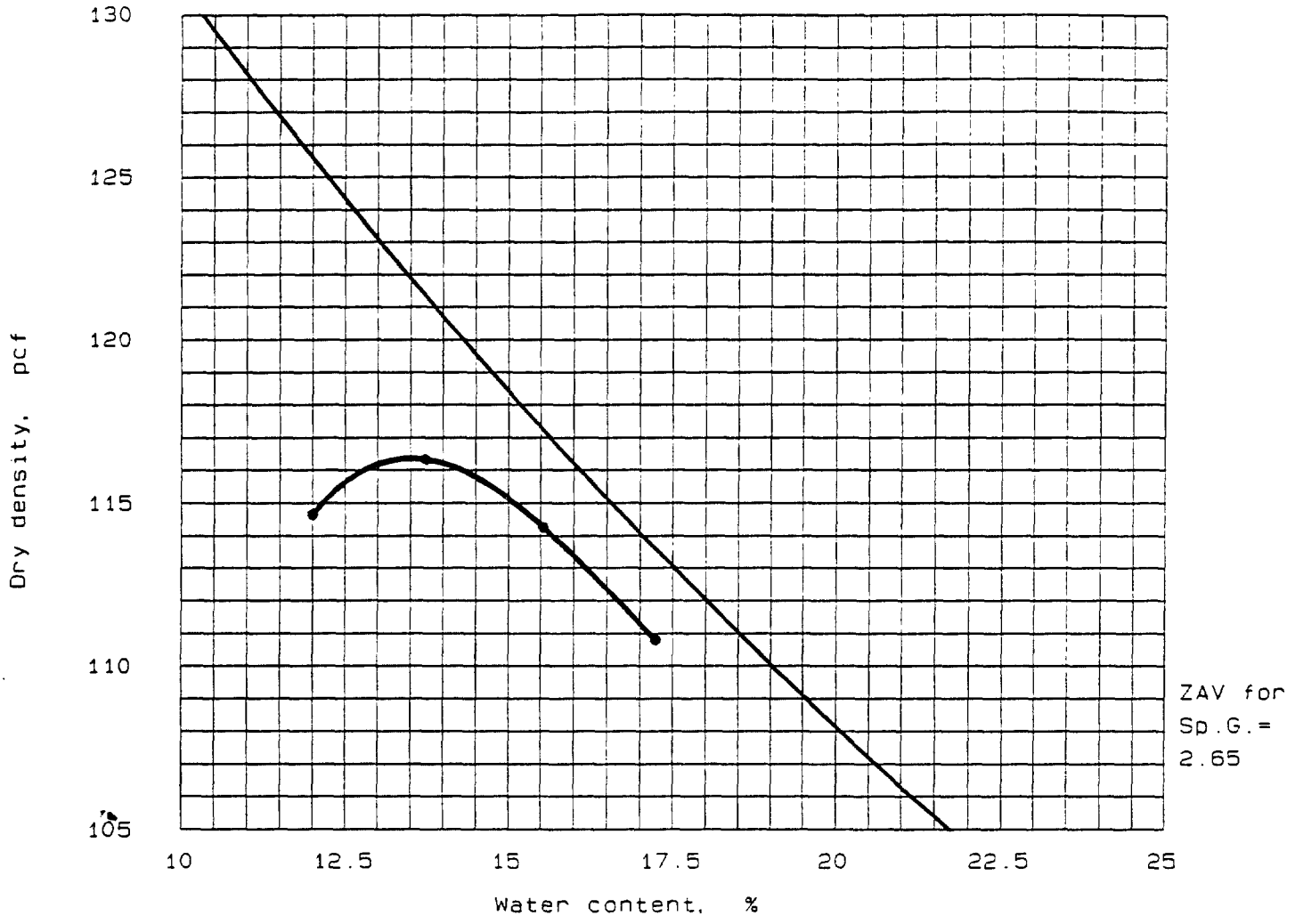
Bingham Engineering

Figure No.

MOISTURE CONTENT AND UNIT WEIGHT
GREEN RIVER LANDFILL

Sample Location	Sample Number	Moisture Content	Dry Density
DH-1	CA-2	5.79	102.92
DH-3	CA-1	6.05	102.37
MW-5	CA-2	3.19	103.21
MW-7	CA-1	6.08	107.05
DH-9	CA-1	4.9	110.34
DA-12	CA-1	5.45	91.45

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CL							

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 13.5 % Maximum dry density = 116.4 pcf	Sandy Silty Clay

Project No.: 2106-003
Project: Green River Landfill
Location: Composite #1

Date: 09/16/94

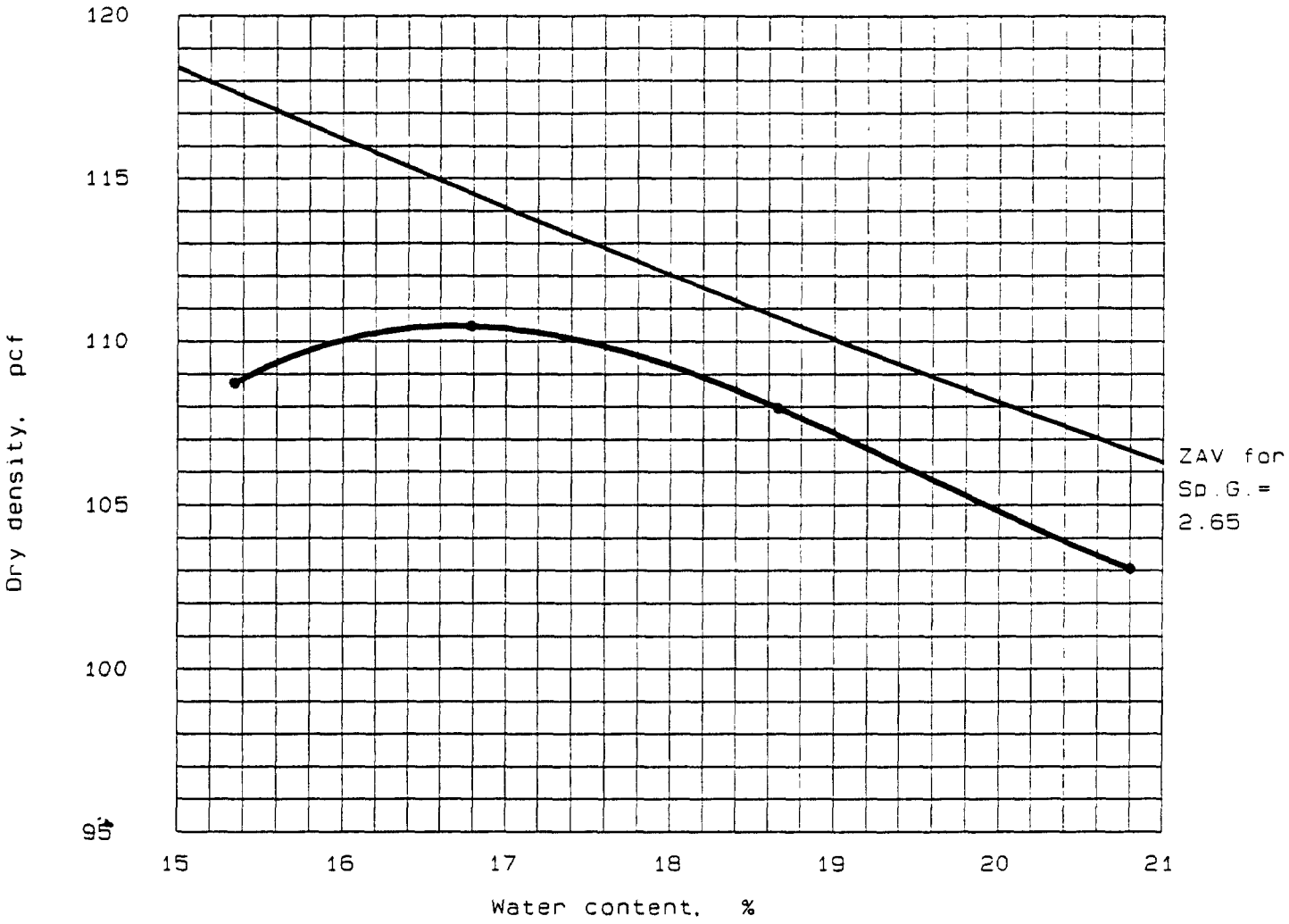
Remarks:
M.M.

PROCTOR TEST REPORT

Bingham Engineering

Figure No. _____

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CL							

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 16.7 % Maximum dry density = 110.5 pcf	Gray Sandy Clay

Project No.: 2106-003
Project: Green River Landfill
Location: Composite #2

Date: 09-16-94

Remarks:

Tested By: MM

PROCTOR TEST REPORT

Bingham Engineering

Figure No. _____

PERMEABILITY TEST RESULTS
GREEN RIVER LANDFILL

Sample Location	Sample Number	Permeability (cm/sec)
DH-1	CA-2*	2.2 E -4
COMPOSITE #1		5.4 E -8
COMPOSITE #2		3.2 E -8

* uncompacted sample

Composite #1 = TP-2 B-1
TP-10 B-1
DH-1 B-2
DH-1 B-3
DH-1 B-4
DH-2 B-2

Composite #1 compacted to 95.6% Proctor and 2.1% above optimum moisture

Composite #2 = MW-5 S-1
DH-6 S-1
TP-4 B-1
TP-8 B-1
TP-3 B-1

Composite #2 compacted to 95.6% Proctor and 3.3% above optimum moisture

KEY	○	○	○	○
BORING	COMPOSITE SAMPLE #2			
SAMPLE	REMOLD 95% MDD + 3% OMC			
DEPTH (FEET)	MDD = 110.5 PCF at 16.7% OMC			
INITIAL w, %	19.7			
INITIAL γ_d, PCF	105.0			
INITIAL e_0				
INITIAL B	0.12			
FINAL w, %			16.7	
FINAL γ_d, PCF			118.4	
FINAL e_f				
FINAL B			1.00	
BACK PRESSURE (PSI)	29.0	29.0	29.0	
STRAIN RATE (INCHES / MINUTE)	.002	.002	.002	

STAGED

MULTI

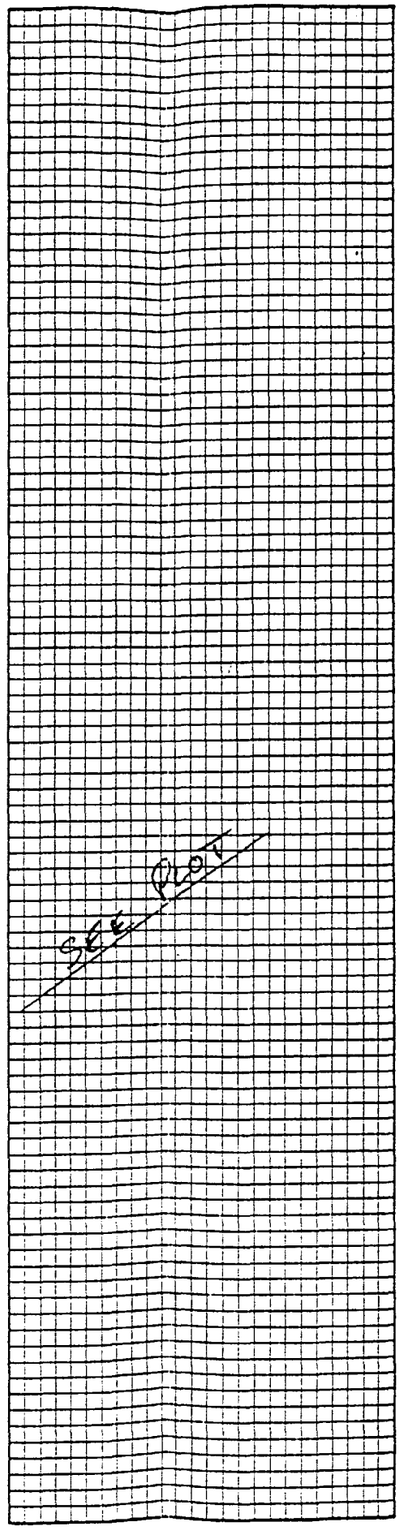
STRESS CONDITION	PEAK $\bar{\sigma}_1 - \bar{\sigma}_3$	MAX. $\bar{\sigma}_1/\bar{\sigma}_3$	PEAK $\bar{\sigma}_1 - \bar{\sigma}_3$	MAX. $\bar{\sigma}_1/\bar{\sigma}_3$	PEAK $\bar{\sigma}_1 - \bar{\sigma}_3$	MAX. $\bar{\sigma}_1/\bar{\sigma}_3$	PEAK $\bar{\sigma}_1 - \bar{\sigma}_3$	MAX. $\bar{\sigma}_1/\bar{\sigma}_3$
TOTAL STRESS ε, %		4.13		5.89		10.86		
TOTAL STRESS TIME TO FAIL (MIN.)								
TOTAL STRESS σ_3, PSF		4032		8064		12096		
TOTAL STRESS $\sigma_1 - \sigma_3$		3973		11052		21090		
TOTAL STRESS σ_1, PSF		8005		19116		33186		
TOTAL STRESS $\frac{1}{2}(\sigma_1 - \sigma_3)$		1986		5526		10545		
TOTAL STRESS $\frac{1}{2}(\sigma_1 + \sigma_3)$		6019		13590		22641		
TOTAL STRESS u, PSF		1570		2218		2016		
TOTAL STRESS A, $u/(\sigma_1 - \sigma_3)$		0.395		0.20		0.096		
EFFECTIVE STRESS ε, %								
EFFECTIVE STRESS TIME TO FAIL (MIN.)								
EFFECTIVE STRESS $\bar{\sigma}_3$, PSF		2462		5846		10080		
EFFECTIVE STRESS $\bar{\sigma}_1 - \bar{\sigma}_3$		3973		11052		21090		
EFFECTIVE STRESS $\bar{\sigma}_1$, PSF		6435		16899		31170		
EFFECTIVE STRESS $\frac{1}{2}(\bar{\sigma}_1 - \bar{\sigma}_3)$		1986		5526		10545		
EFFECTIVE STRESS $\frac{1}{2}(\bar{\sigma}_1 + \bar{\sigma}_3)$		4449		11373		20625		
EFFECTIVE STRESS u, PSF		—		—		—		
EFFECTIVE STRESS A, $u/(\bar{\sigma}_1 - \bar{\sigma}_3)$		—		—		—		
EFFECTIVE STRESS $\bar{\sigma}_1/\bar{\sigma}_3$		2.61		2.89		3.09		

REMARKS

PRINCIPAL STRESS DIFFERENCE $\sigma_1 - \sigma_3$, PSF

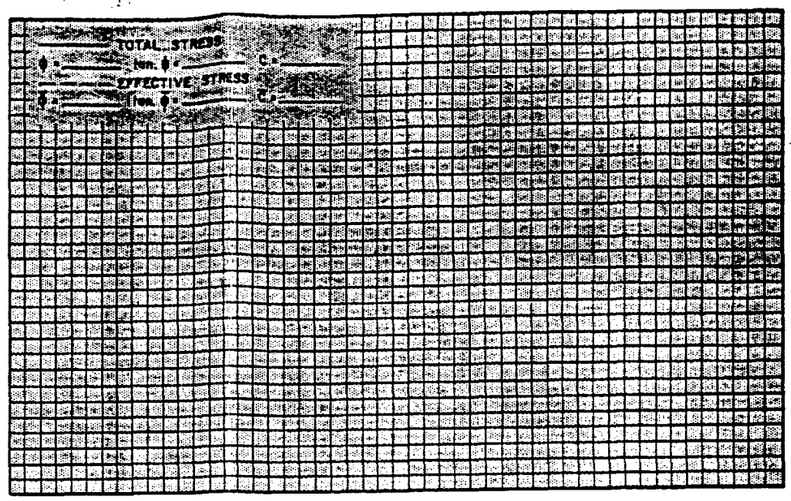
PRINCIPAL STRESS RATIO $\bar{\sigma}_1/\bar{\sigma}_3$

PORE PRESSURE, Δu, PSF OR VOLUMETRIC STRAIN, ε_v, %



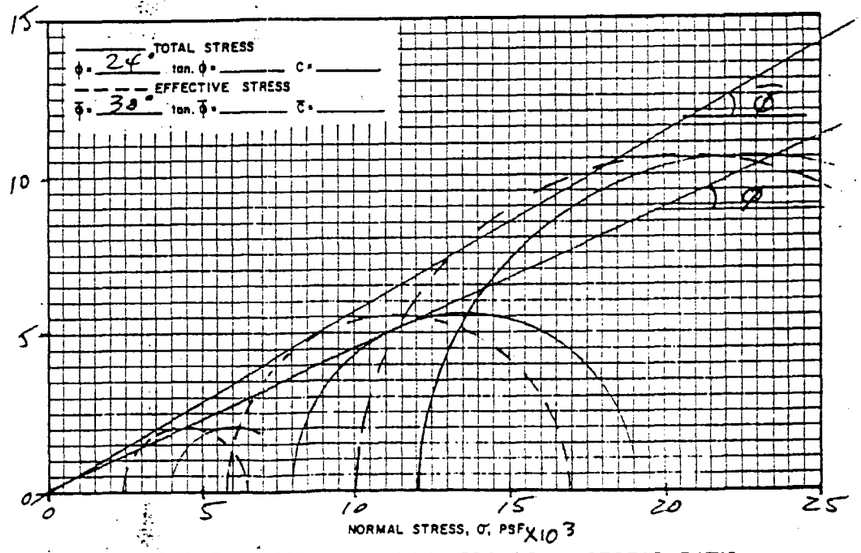
AXIAL STRAIN, ε, %

SHEAR STRESS, T, PSF



NORMAL STRESS, σ, PSF

MOHR ENVELOPE – PEAK STRESS



MOHR ENVELOPE – MAXIMUM EFFECTIVE STRESS RATIO

TRIAXIAL COMPRESSION TEST REPORT

TYPE OF TEST: CONS-UNDRAINED W PORE PRESSURE

TYPE MATERIAL: REMOLD

SAMPLE DESCRIPTION

CLASSIFICATION: CL

LIQUID LIMIT: — PLASTIC LIMIT: — SPECIFIC GRAVITY, G_s: —

PROJECT: BINGHAM ENGR.

LOCATION: GREEN RIVER LANDFILL

JOB NO. 05461-029-6079 PREPARED BY: EEI, 10/6/94

CHECKED BY: , / /

PLATE

KEY	○	○	○	○
BORING	COMPOSITE #1			
SAMPLE	REMOLD @ 95% MOD at +3% OMC			
DEPTH (FEET)	MOD = 116.4 PCF at 13.5% OMC			
INITIAL w, %	16.5			
INITIAL γ_d, PCF	110.6			
INITIAL ϕ_0				
INITIAL B	0.1			
FINAL w, %			14.7	
FINAL γ_d, PCF			121.4	
FINAL ϕ_1				
FINAL B			0.98	
BACK PRESSURE (PSI)	39.0	39.0	39.0	
STRAIN RATE (INCHES / MINUTE)	0.002	.002	.002	

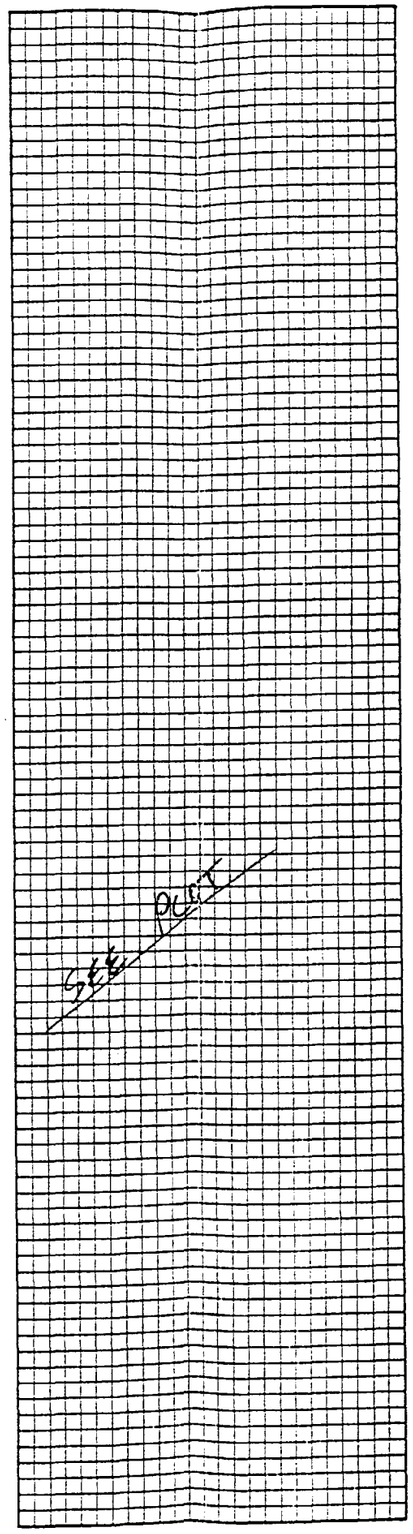
MULTI-STAGED

STRESS CONDITION	PEAK $\sigma_1-\sigma_3$	MAX. $\bar{\sigma}_1/\bar{\sigma}_3$	PEAK $\sigma_1-\sigma_3$	MAX. $\bar{\sigma}_1/\bar{\sigma}_3$	PEAK $\sigma_1-\sigma_3$	MAX. $\bar{\sigma}_1/\bar{\sigma}_3$	PEAK $\sigma_1-\sigma_3$	MAX. $\bar{\sigma}_1/\bar{\sigma}_3$
TOTAL STRESS ε, %		3.59		4.62		3.21		
TOTAL STRESS TIME TO FAIL (MIN.)								
TOTAL STRESS σ_3, PSF		4032		8064		11952		
TOTAL STRESS $\sigma_1-\sigma_3$		4050		9355		16613		
TOTAL STRESS σ_1, PSF		8082		17419		28565		
TOTAL STRESS $\frac{1}{2}(\sigma_1-\sigma_3)$		2025		4677		8307		
TOTAL STRESS $\frac{1}{2}(\sigma_1+\sigma_3)$		6057		12742		20259		
TOTAL STRESS u, PSF		2002		4349		5414		
TOTAL STRESS A, $u/(\sigma_1-\sigma_3)$		0.494		0.465		0.326		
EFFECTIVE STRESS ε, %								
EFFECTIVE STRESS TIME TO FAIL (MIN.)								
EFFECTIVE STRESS $\bar{\sigma}_3$, PSF		2030		3715		6538		
EFFECTIVE STRESS $\bar{\sigma}_1-\bar{\sigma}_3$		4050		9355		16613		
EFFECTIVE STRESS $\bar{\sigma}_1$, PSF		6080		13070		23151		
EFFECTIVE STRESS $\frac{1}{2}(\bar{\sigma}_1-\bar{\sigma}_3)$		2025		4677		8307		
EFFECTIVE STRESS $\frac{1}{2}(\bar{\sigma}_1+\bar{\sigma}_3)$		4056		8392		14844		
EFFECTIVE STRESS u, PSF		—		—		—		
EFFECTIVE STRESS A, $u/(\bar{\sigma}_1-\bar{\sigma}_3)$		—		—		—		
$\bar{\sigma}_1/\bar{\sigma}_3$		2.99		3.52		3.54		
REMARKS								

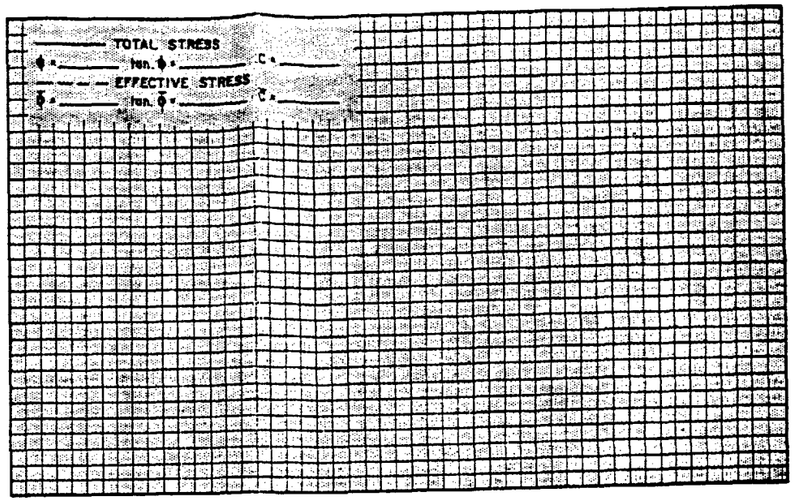
PRINCIPAL STRESS DIFFERENCE $\sigma_1-\sigma_3$, PSF

PORE PRESSURE, ΔU, PSF OR VOLUMETRIC STRAIN, ε_v, %

PRINCIPAL STRESS RATIO $\bar{\sigma}_1/\bar{\sigma}_3$



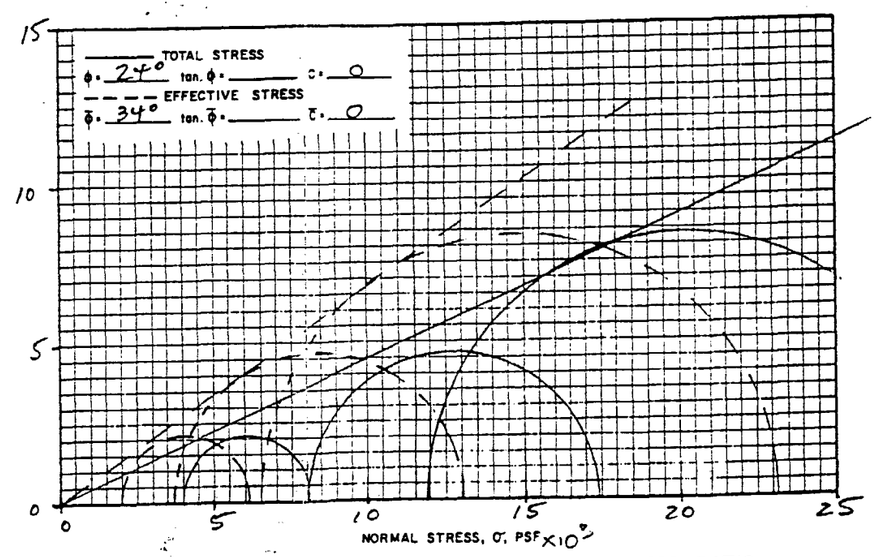
AXIAL STRAIN, ε, %



NORMAL STRESS, σ, PSF

MOHR ENVELOPE – PEAK STRESS

SHEAR STRESS, T, PSF



MOHR ENVELOPE – MAXIMUM EFFECTIVE STRESS RATIO

TRIAXIAL COMPRESSION TEST REPORT

TYPE OF TEST: CONS-UNDRAINED W PORE PRESSURE

TYPE MATERIAL: REMOLD

SAMPLE DESCRIPTION

CLASSIFICATION: CL

LIQUID LIMIT: — PLASTIC LIMIT: — SPECIFIC GRAVITY, G_s: —

PROJECT: BINGHAM ENGR.

LOCATION: GREEN RIVER LANDFILL

JOB NO: 05461-029-6079 PREPARED BY: EGL, 10/6/94

CHECKED BY: _____, / /

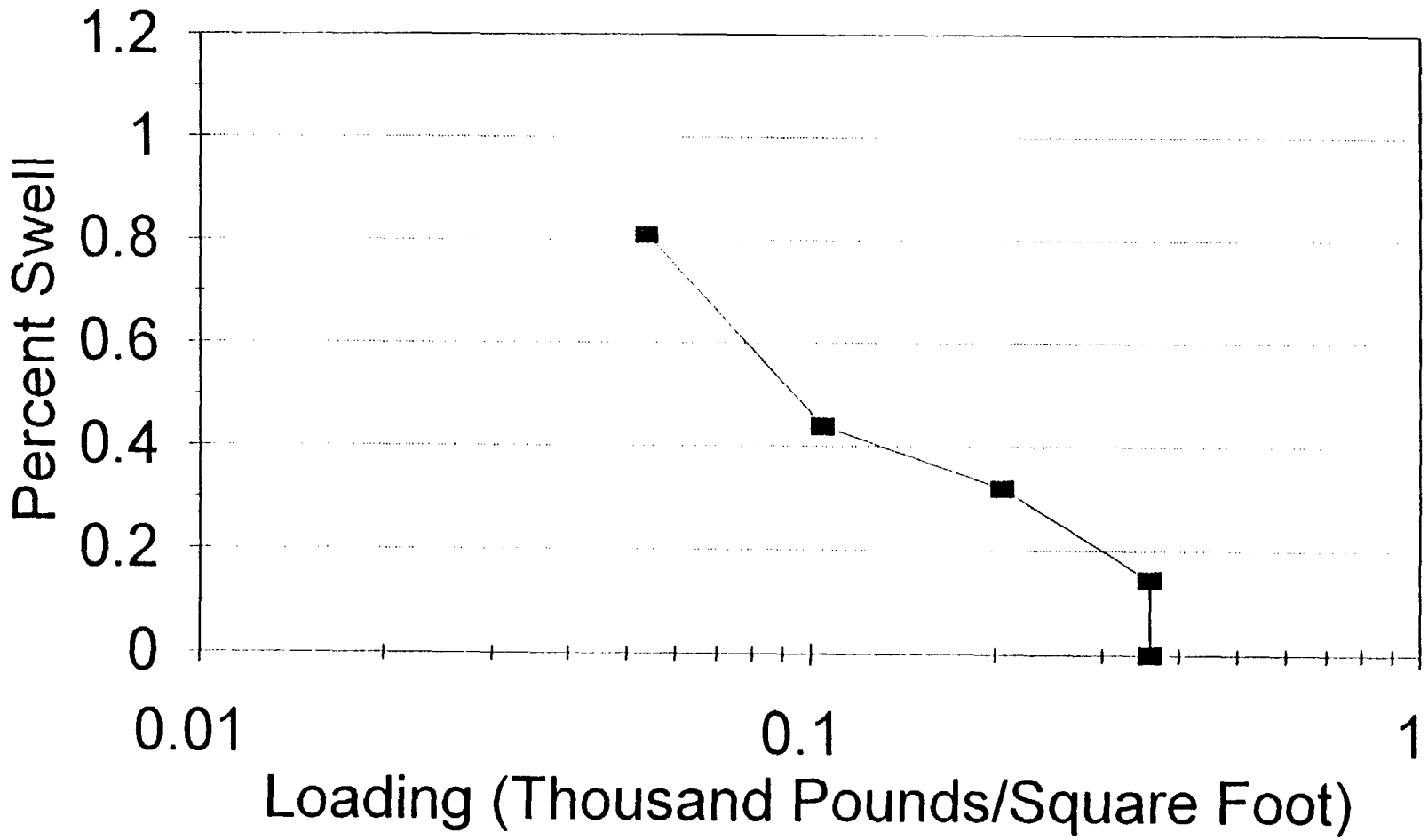
PLATE

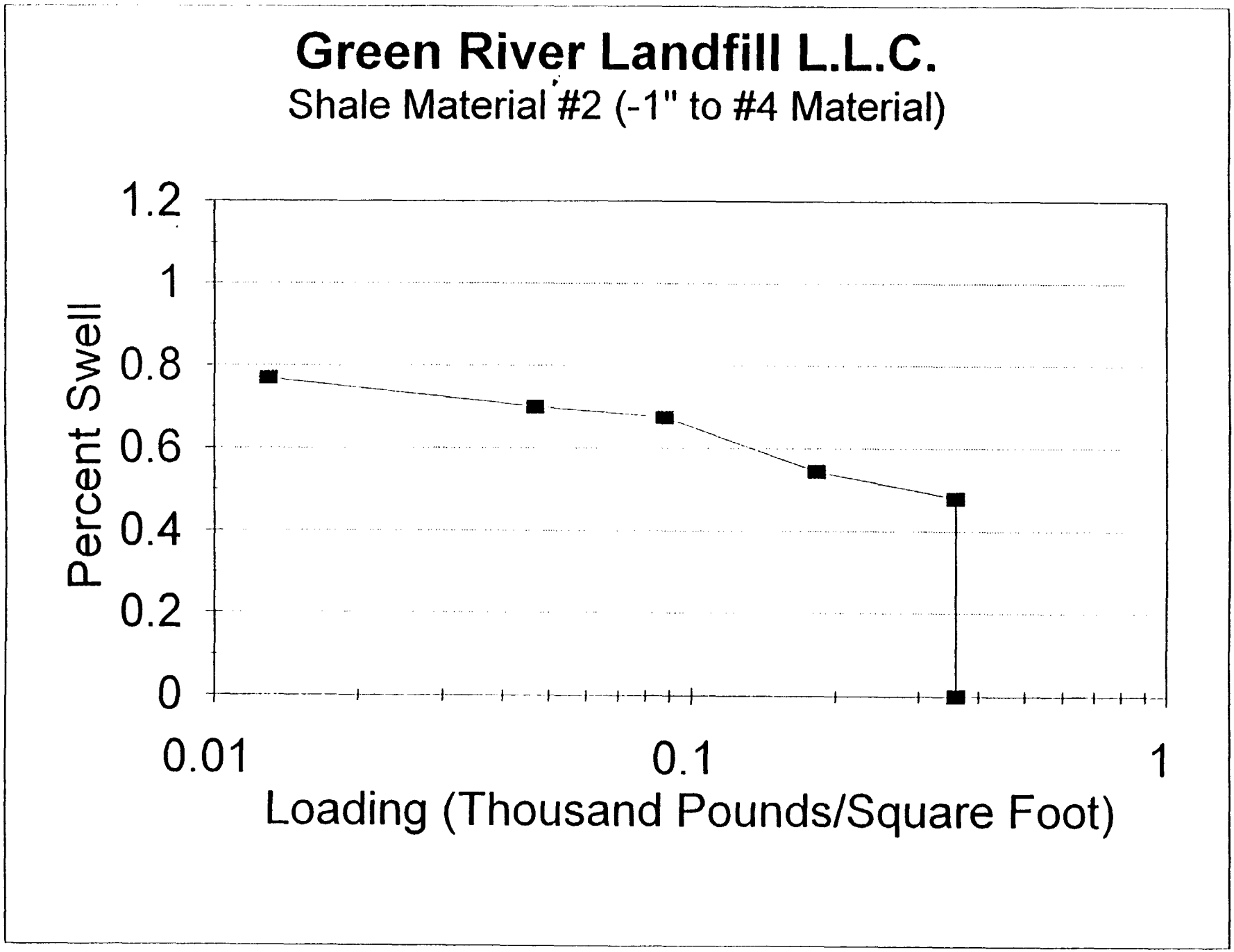
SHALE CHARACTERISTICS
MANCOS SWELLING POTENTIAL LABORATORY TESTING
GREEN RIVER LANDFILL L.L.C.

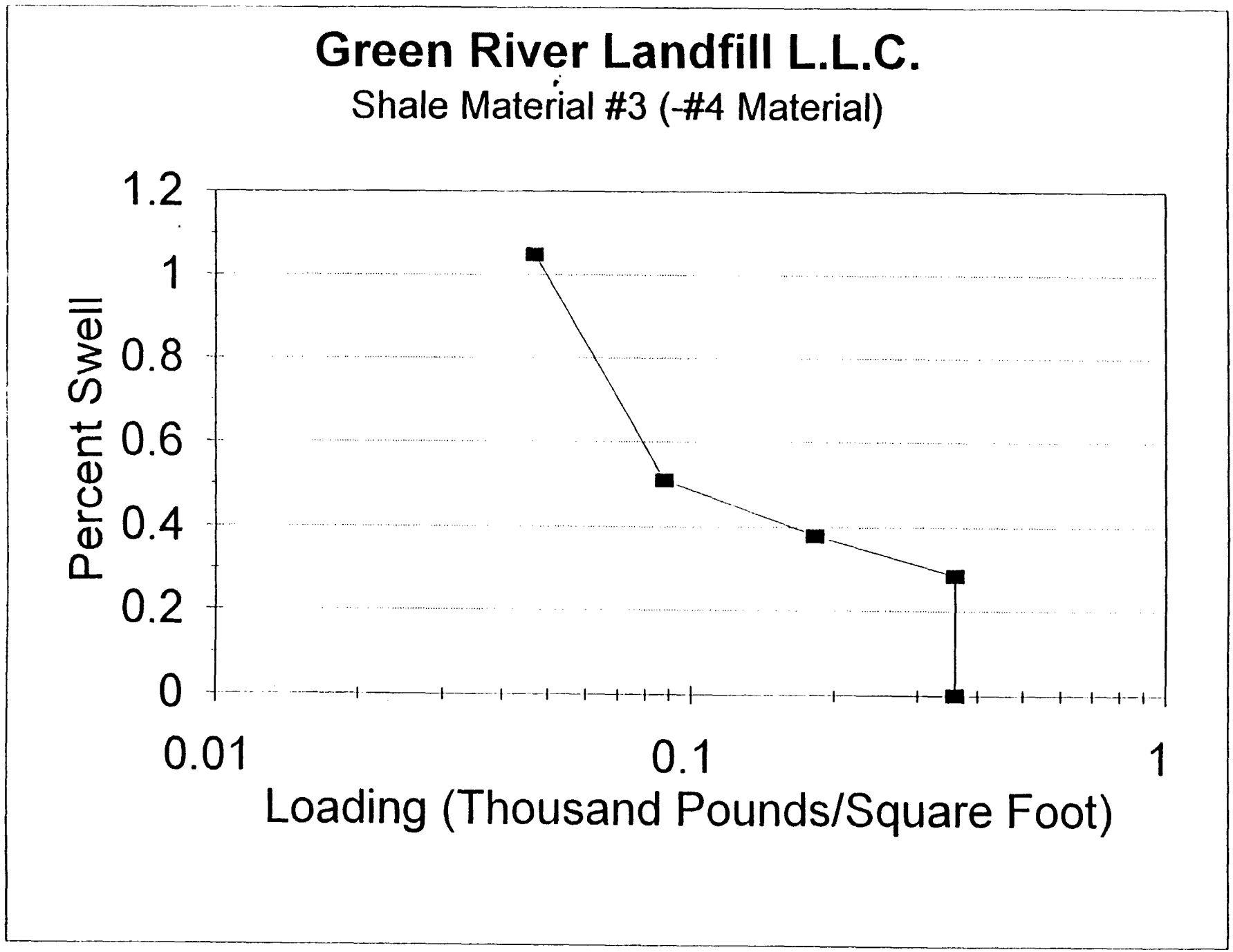
Sample No.	Sieve Size	Specific Gravity	Initial Void Ratio	Natural Moisture	Dry Density
1	- 1" to #4	2.65	0.7168	3.1 %	96.4 pcf
2	- 1" to #4	2.65	0.6696	2.9 %	99.1 pcf
3	- #4	2.65	0.5247	6.4 %	108.5 pcf
4	- #4	2.65	0.4903	6.4 %	111.0 pcf

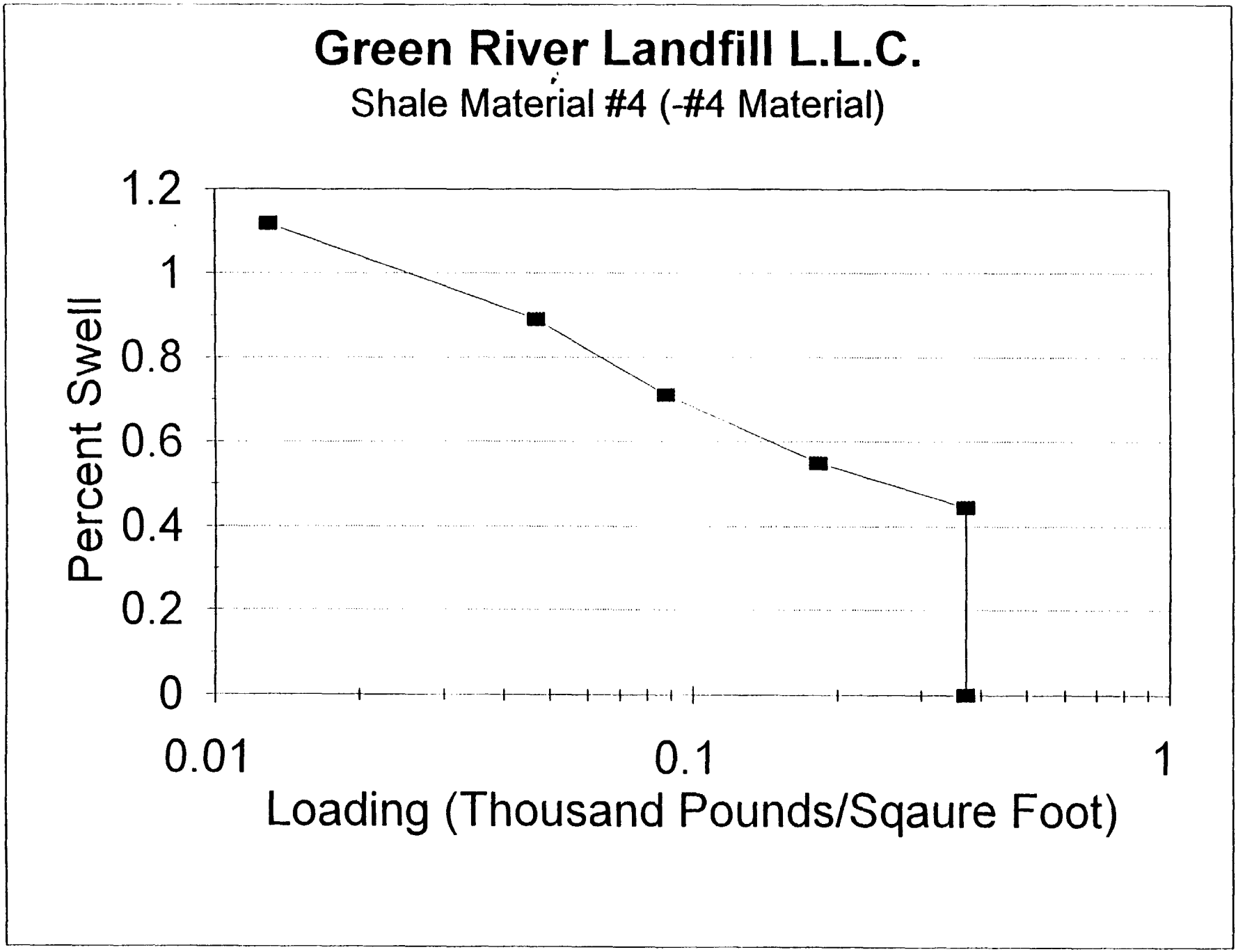
Green River Landfill L.L.C.

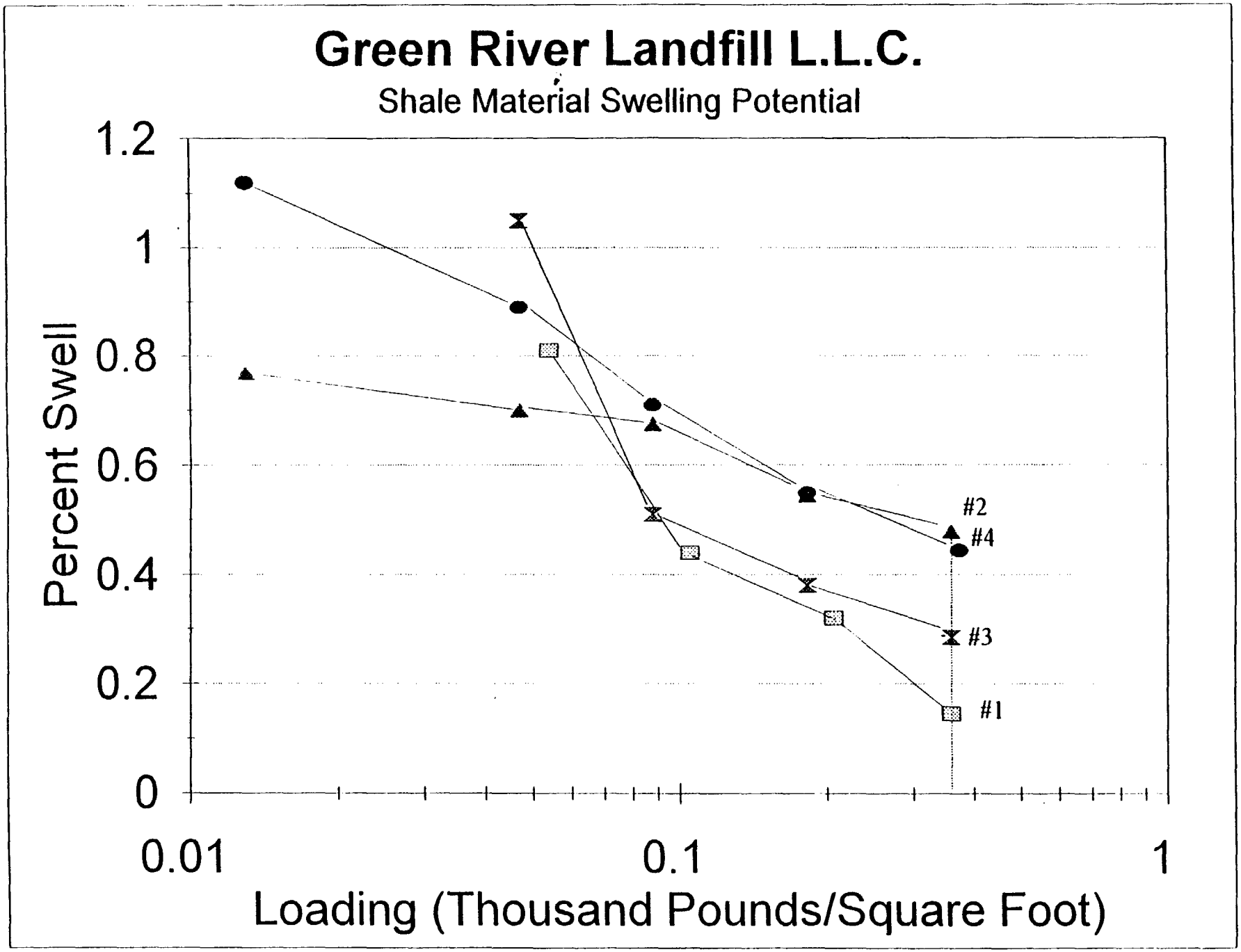
Shale Material #1 (-1" to #4 Material)




Green River Landfill L.L.C.
Shale Material #2 (-1" to #4 Material)
Percent Swell
1.2
1
0.8
0.6
0.4
0.2
0
0.01
0.1
1
Loading (Thousand Pounds/Square Foot)


Green River Landfill L.L.C.
Shale Material #3 (-#4 Material)
Percent Swell
1.2
1
0.8
0.6
0.4
0.2
0
0.01
0.1
1
Loading (Thousand Pounds/Square Foot)


Green River Landfill L.L.C.
Shale Material #4 (-#4 Material)
Percent Swell
1.2
1
0.8
0.6
0.4
0.2
0
0.01
0.1
1
Loading (Thousand Pounds/Sqaure Foot)


Green River Landfill L.L.C.
Shale Material Swelling Potential
Percent Swell
1.2
1
0.8
0.6
0.4
0.2
0
0.01
0.1
1
Loading (Thousand Pounds/Square Foot)
#2
#4
#3
#1

INORGANIC ANALYSIS REPORT

AMERICAN WEST ANALYTICAL LABORATORIES

63 West 3600 South
Salt Lake City, Utah
84115

(801) 263-8686
Fax (801) 263-8687

Client: Bingham Environmental
Date Received: August 1, 1994
Lab Sample ID Number: 19299-01
Field Sample ID: Green River, UT/MW-1

Contact: Kevin Cosper
Received By: Elona Hayward

Analytical Results

DISSOLVED METALS	Method Used:	Detection Limit: mg/L	Amount Detected: mg/L
Aluminum	6010	0.1	**0.1**
Antimony	6010	0.1	<0.1
Arsenic	7060	0.005	<0.005
Barium	6010	0.002	**0.009**
Beryllium	6010	0.005	<0.005
Cadmium	6010	0.004	**0.005**
Chromium	6010	0.005	<0.005
Cobalt	6010	0.01	<0.01
Copper	6010	0.004	**0.014**
Iron	6010	0.01	**0.10**
Lead	7421	0.005	<0.005
Manganese	6010	0.005	**0.051**
Mercury	7471	0.0002	<0.0002
Molybdenum	6010	0.1	<0.1
Nickel	6010	0.005	**0.033**
Selenium	7740	0.005	**0.61**
Silver	6010	0.005	<0.005
Thallium	6010	0.4	<0.4
Tin	6010	0.1	**0.1**
Vanadium	6010	0.005	**0.016**
Zinc	6010	0.002	**0.038**

Released by: _____
Laboratory Supervisor

INORGANIC ANALYSIS REPORT

AMERICAN WEST ANALYTICAL LABORATORIES

63 West 3600 South
Salt Lake City, Utah
84115

(801) 263-8686
Fax (801) 263-8687

Client: Bingham Environmental
Date Received: August 1, 1994
Lab Sample ID Number: 19299-01
Field Sample ID: Green River, UT/MW-1

Contact: Kevin Cosper
Received By: Elona Hayward

Analytical Results

	Method Used:	Detection Limit: mg/L	Amount Detected: mg/L
TOTAL METALS			
Calcium	6010	0.01	440.
Magnesium	6010	0.01	710.
Potassium	6010	0.01	28.
Sodium	6010	0.01	6,400.
OTHER CHEMISTRIES			
Bicarbonate (as $CaCO_3$)	310.1	10.	1,100.
Carbonate (as $CaCO_3$)	310.1	10.	<10.
Chloride	4500 CLB	0.5	250.
Conductivity	120.1	10.	21,000. µmhos/cm @ 25° C
Cyanide	335.3	0.005	0.01
Fluoride	340.1	0.1	6.8
Nitrate (as N)	353.2	0.01	140.
pH	150.1	0.1	7.3
Sulfate	375.4	5.0	15,000.
TDS	160.1	1.0	20,000.

Released by: _____
Laboratory Supervisor

Report Date 8/8/94

INORGANIC ANALYSIS REPORT

AMERICAN WEST ANALYTICAL LABORATORIES

53 West 3600 South
Salt Lake City, Utah
84115

(801) 263-8686
Fax (801) 263-8687

Client: Bingham Environmental
Date Received: August 1, 1994
Lab Sample ID Number: 19299-02
Field Sample ID: Green River, UT/MW-2

Contact: Kevin Cosper
Received By: Elona Hayward

Analytical Results

DISSOLVED METALS	Method Used:	Detection Limit: mg/L	Amount Detected: mg/L
Aluminum	6010	0.1	<0.1
Antimony	6010	0.1	<0.1
Arsenic	7060	0.005	<0.005
Barium	6010	0.002	**0.008**
Beryllium	6010	0.005	<0.005
Cadmium	6010	0.004	<0.004
Chromium	6010	0.005	<0.005
Cobalt	6010	0.01	<0.01
Copper	6010	0.004	<0.004
Iron	6010	0.01	**0.04**
Lead	7421	0.005	<0.005
Manganese	6010	0.005	**0.032**
Mercury	7471	0.0002	<0.0002
Molybdenum	6010	0.1	<0.1
Nickel	6010	0.005	<0.005
Selenium	7740	0.005	<0.005
Silver	6010	0.005	<0.005
Thallium	6010	0.4	<0.4
Tin	6010	0.1	<0.1
Vanadium	6010	0.005	<0.005
Zinc	6010	0.002	**0.008**

Released by: _____
Laboratory Supervisor

Report Date 8/8/94

INORGANIC ANALYSIS REPORT

AMERICAN
WEST
ANALYTICAL
LABORATORIES

53 West 3600 South
Salt Lake City, Utah
84115

(801) 263-8686
Fax (801) 263-8687

Client: Bingham Environmental
Date Received: August 1, 1994
Lab Sample ID Number: 19299-02
Field Sample ID: Green River, UT/MW-2

Contact: Kevin Cosper
Received By: Elona Hayward

Analytical Results

	Method Used:	Detection Limit: mg/L	Amount Detected: mg/L
TOTAL METALS			
Calcium	6010	0.01	**31.**
Magnesium	6010	0.01	**21.**
Potassium	6010	0.01	**7.9**
Sodium	6010	0.01	**4,500.**
OTHER CHEMISTRIES			
Bicarbonate (as $CaCO_3$)	310.1	10.	**1,300.**
Carbonate (as $CaCO_3$)	310.1	10.	<10.
Chloride	4500 CLB	0.5	**2,000.**
Conductivity	120.1	10.	**16,000.** µmhos/cm @ 25° C
Cyanide	335.3	0.005	<0.005
Fluoride	340.1	0.1	**3.0**
Nitrate (as N)	353.2	0.01	**0.03**
pH	150.1	0.1	**7.5**
Sulfate	375.4	5.0	**5,900.**
TDS	160.1	1.0	**11,000.**

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Laboratory Supervisor

Report Date 8/8/94

INORGANIC ANALYSIS REPORT

AMERICAN
WEST
ANALYTICAL
LABORATORIES

53 West 3600 South
Salt Lake City, Utah
84115

(801) 263-8686
Fax (801) 263-8687

Client: Bingham Environmental
Date Received: August 1, 1994
Lab Sample ID Number: 19299-03
Field Sample ID: Green River, UT/MW-5

Contact: Kevin Cosper
Received By: Elona Hayward

Analytical Results

DISSOLVED METALS	Method Used:	Detection Limit: mg/L	Amount Detected: mg/L
Aluminum	6010	0.1	**0.1**
Antimony	6010	0.1	<0.1
Arsenic	7060	0.005	<0.005
Barium	6010	0.002	**0.005**
Beryllium	6010	0.005	<0.005
Cadmium	6010	0.004	**0.005**
Chromium	6010	0.005	<0.005
Cobalt	6010	0.01	<0.01
Copper	6010	0.004	**0.023**
Iron	6010	0.01	**0.11**
Lead	7421	0.005	<0.005
Manganese	6010	0.005	**0.020**
Mercury	7471	0.0002	<0.0002
Molybdenum	6010	0.1	<0.1
Nickel	6010	0.005	**0.032**
Selenium	7740	0.005	**0.51**
Silver	6010	0.005	<0.005
Thallium	6010	0.4	<0.4
Tin	6010	0.1	**0.1**
Vanadium	6010	0.005	**0.017**
Zinc	6010	0.002	**0.058**

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Report Date 8/8/94

INORGANIC ANALYSIS REPORT

AMERICAN WEST ANALYTICAL LABORATORIES

463 West 3600 South
Salt Lake City, Utah
84115

(801) 263-8686
Fax (801) 263-8687

Client: Bingham Environmental
Date Received: August 1, 1994
Lab Sample ID Number: 19299-03
Field Sample ID: Green River, UT/MW-5

Contact: Kevin Cosper
Received By: Elona Hayward

Analytical Results

	Method Used:	Detection Limit:	Amount Detected:
TOTAL METALS		mg/L	mg/L
Calcium	6010	0.01	440.
Magnesium	6010	0.01	720.
Potassium	6010	0.01	27.
Sodium	6010	0.01	6,400.
OTHER CHEMISTRIES			
Bicarbonate (as $CaCO_3$)	310.1	10.	1,100.
Carbonate (as $CaCO_3$)	310.1	10.	<10.
Chloride	4500 CLB	0.5	180.
Conductivity	120.1	10.	21,000. µmhos/cm @ 25° C
Cyanide	335.3	0.005	0.008
Fluoride	340.1	0.1	6.8
Nitrate (as N)	353.2	0.01	130.
pH	150.1	0.1	7.2
Sulfate	375.4	5.0	15,000.
TDS	160.1	1.0	19,000.

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Report Date 8/8/94

INORGANIC ANALYSIS REPORT

AMERICAN WEST ANALYTICAL LABORATORIES

63 West 3600 South
Salt Lake City, Utah
84115

(801) 263-8686
Fax (801) 263-8687

Client: Bingham Environmental
Date Received: August 1, 1994
Lab Sample ID Number: 19299-04
Field Sample ID: Green River, UT/DH-2

Contact: Kevin Cosper
Received By: Elona Hayward

Analytical Results

	Method Used:	Detection Limit: mg/L	Amount Detected: mg/L
TDS	160.1	1.0	**9,400.**

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Report Date 8/8/94

INORGANIC ANALYSIS REPORT

AMERICAN WEST ANALYTICAL LABORATORIES

463 West 3600 South
Salt Lake City, Utah
84115

(801) 263-8686
Fax (801) 263-8687

Client: Bingham Environmental
Date Received: August 1, 1994
Lab Sample ID Number: 19299-05
Field Sample ID: Green River, UT/DH-10

Contact: Kevin Cosper
Received By: Elona Hayward

Analytical Results

	Method Used:	Detection Limit: mg/L	Amount Detected: mg/L
TDS	160.1	1.0	**30,000.**

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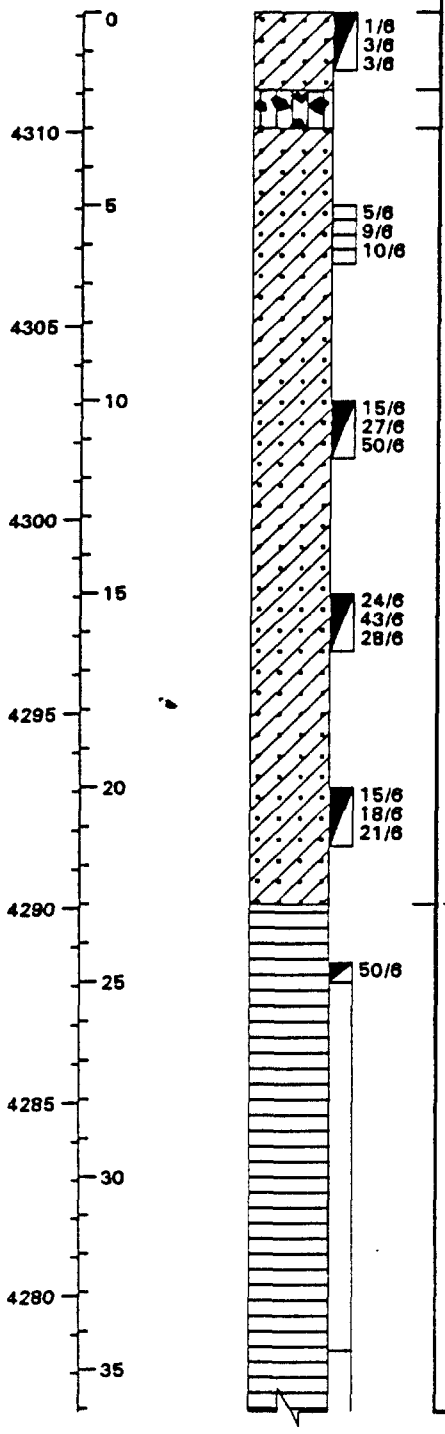
Laboratory Supervisor

Report Date 8/8/94

DRILL HOLE LOG
DRILL HOLE NO.: DH-1

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: Northwest Corner
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-21-94
TOC ELEV.: NA
GS ELEV.: 4313.12
LOGGED BY: DEW
HOLE NO.: DH-1



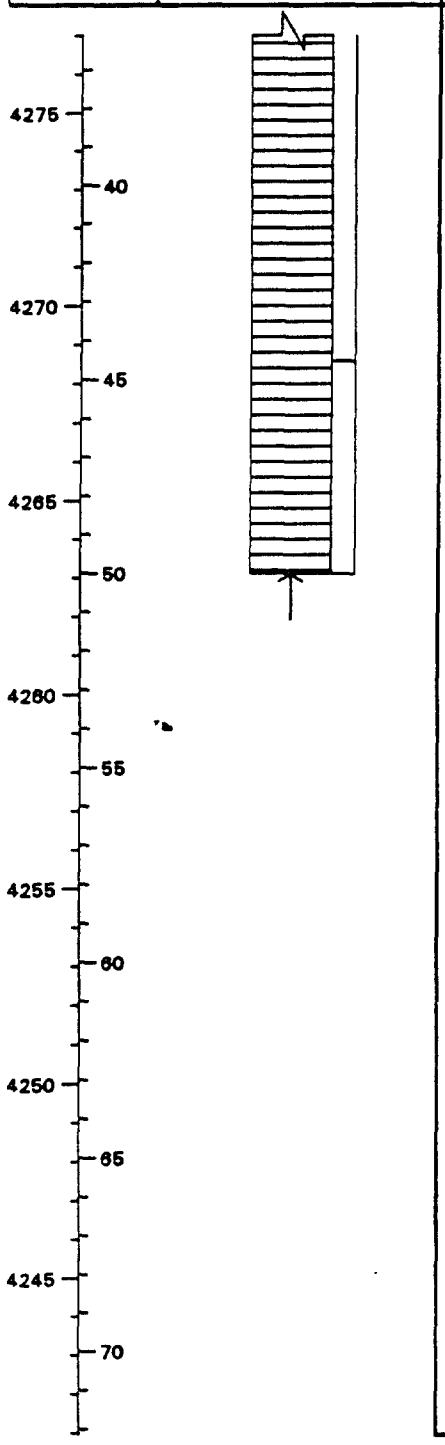
ELEVATION / DEPTH	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
	[SC] CLAYEY SAND: Brown, slightly silty, roots, medium dense, dry.	B-1	0-1.5	14/18	
	[GM] SILTY GRAVEL: Brown, slightly clayey, dense, dry.				
	[SC] CLAYEY SAND: Brown, occasional gravel, medium dense to dense, slightly moist.	CA-2	5-6.5	16/18	
		B-2	10-11.5	18/18	
		B-3	15-16.5	18/18	
	...Grades dense.				
		B-4	20-21.5	18/18	
	SHALE: Gray, gypsum along fractures, very close to close spaced fractures, fractures are non-intersecting open planes with intersecting open planes at 26 feet, slightly weathered to fresh, dry. (Began coring at 25 feet)	B-5	24.5-25 25-34.5	6/6 114/114	..... 0 ..... 33 ..... 58 75
	...Close to moderate spaced factures from 29 to 34.5 feet.				..... 83 100
	...Moderate spaced fractures from 34.5 to 50 feet.		34.5-44.5	120/120	

Hole diameter is 7.75 inches from 0 to 25 feet; and 4.25 inches from 25 to 50 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-1

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: Northwest Corner
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-21-94
TOC ELEV.: NA
GS ELEV.: 4313.12
LOGGED BY: DEW
HOLE NO.: DH-1



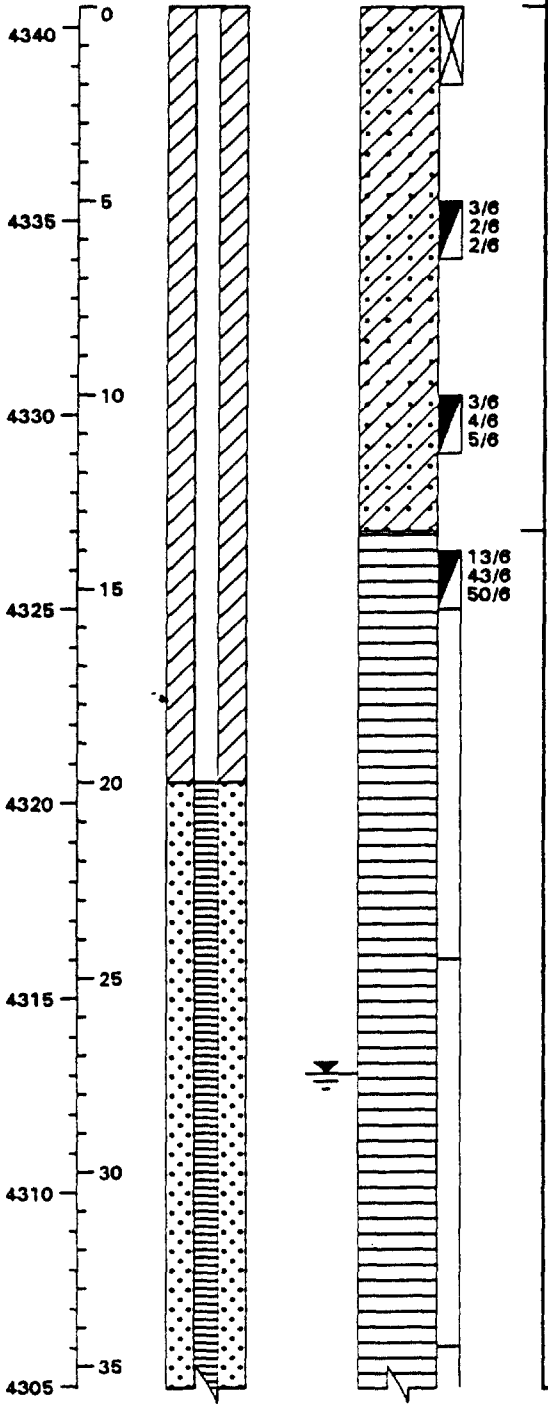
ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
			44.5-50	120/120	

Hole diameter is 7.75 inches from 0 to 25 feet; and 4.25 inches from 25 to 50 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-2

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 27.46'

PROJECT NO.: 2106-002
DATE: 6-22-94
TOC ELEV.: 4345.28
GS ELEV.: 4340.53
LOGGED BY: DEW
HOLE NO.: DH-2



ELEVATION / DEPTH	WELL DETAILS	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
			[SC] CLAYEY SAND: Brown, slightly silty, roots, occasional gravel, loose to medium dense, dry to moist.	S-1	0-2	24/24	
				B-1	5-6.5	18/18	
				B-2	10-11.5	18/18	
			...Grades gravely.				
			SHALE: Gray, gypsum along fractures, very close to close spaced fractures, fractures are non-intersecting open planes, fresh, dry. (Began coring at 15.5 feet)	B-3	14-15.5	18/18	
					15.5-24.5	108/108	0
							58
			...Moderate spaced fractures from 18.5 to 24.5 feet.				33
							100
			...Close spaced fractures from 24.5 to 43.5 feet.		24.5-34.5	120/120	25
							100
							0
			...Grades wet.				92
							100
							75
							100
							67
					34.5-	108/	100

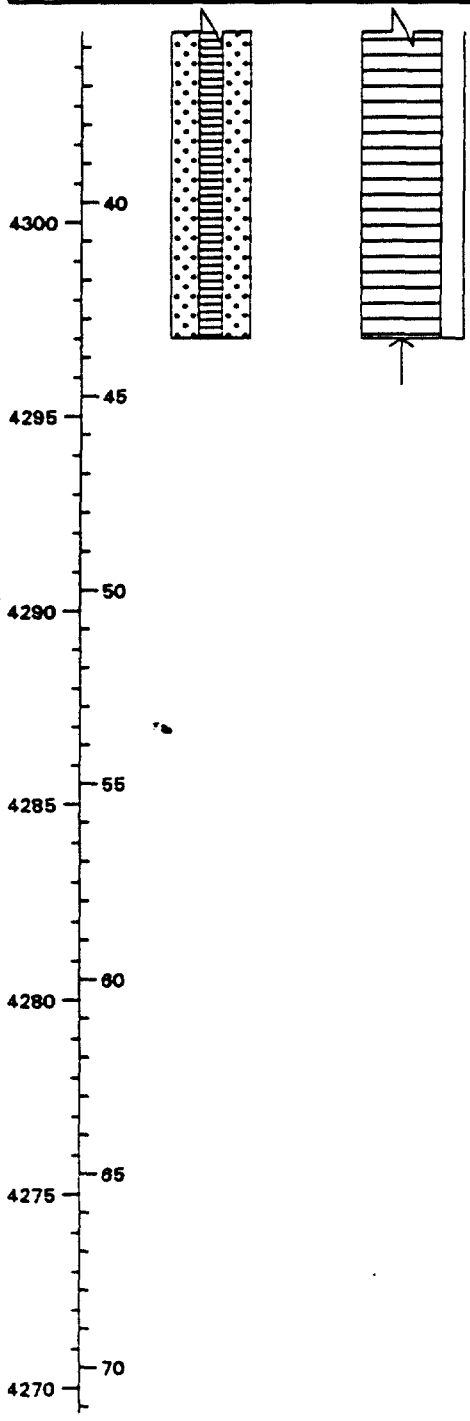
Hole diameter is 7.75 inches from 0 to 15.5 feet; and 4.25 inches from 15.5 to 43.5 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-2

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 27.46'

PROJECT NO.: 2106-002
DATE: 6-22-94
TOC ELEV.: 4345.28
GS ELEV.: 4340.53
LOGGED BY: DEW
HOLE NO.: DH-2

ELEVATION / DEPTH	WELL DETAILS	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
					43.5	108	
							75

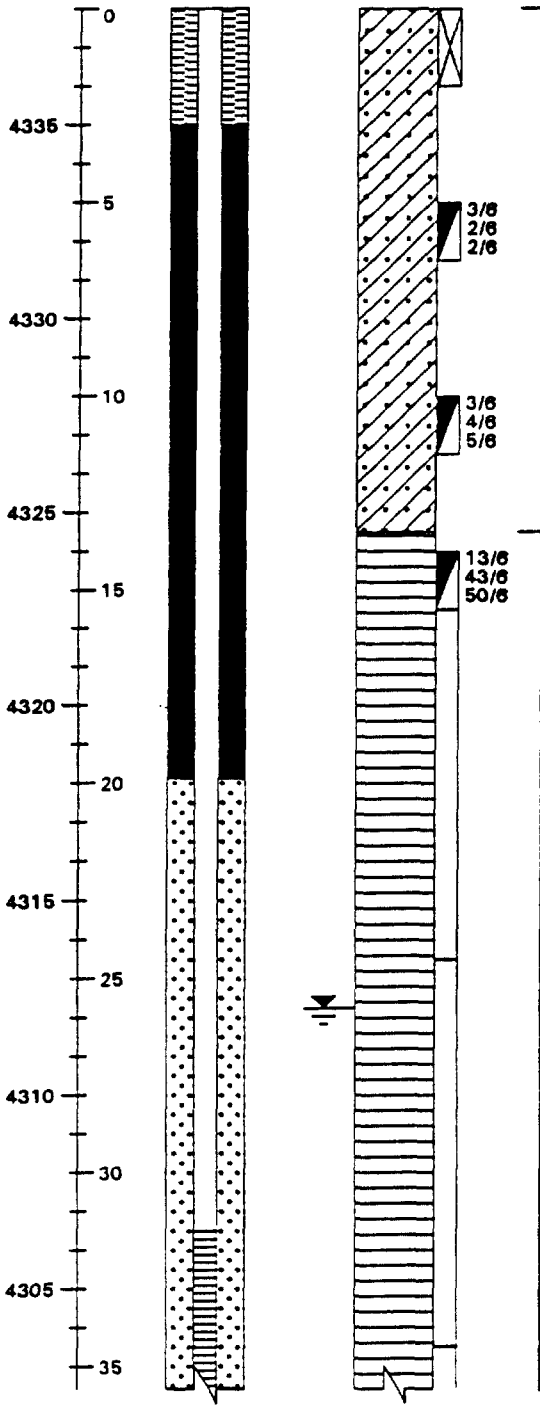


Hole diameter is 7.75 inches from 0 to 15.5 feet; and 4.25 inches from 15.5 to 43.5 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-2

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: 38 feet north of DH-2
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 25.75'

PROJECT NO.: 2106-003
DATE: 7-12-94
TOC ELEV.:
GS ELEV.: 4338
LOGGED BY: DCH
HOLE NO.: MW-2



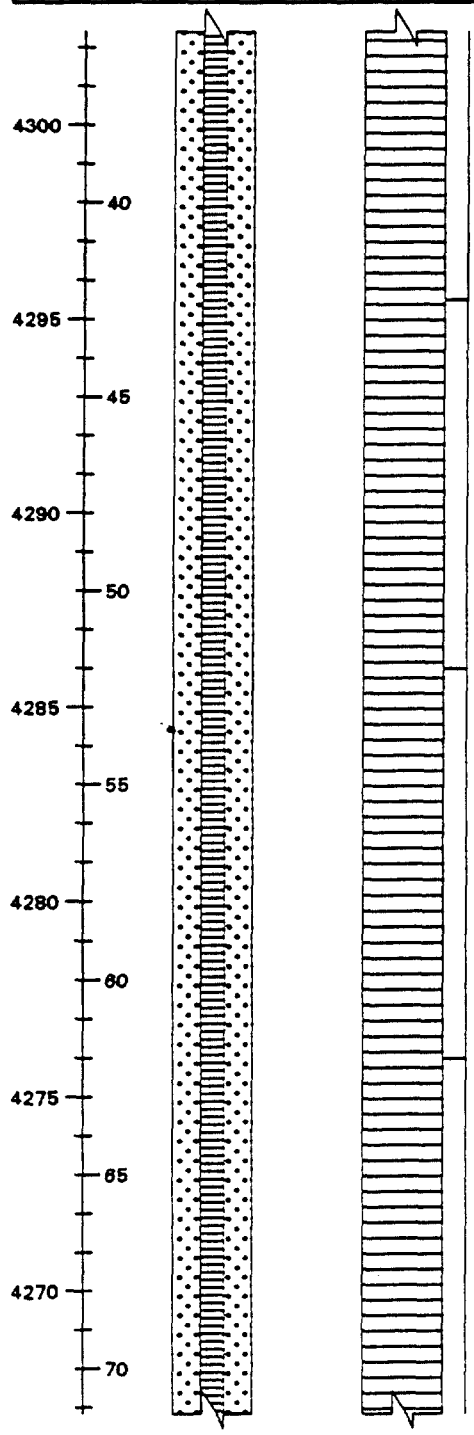
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
[SC] CLAYEY SAND: Brown, slightly silty, roots, occasional gravel, loose to medium dense, dry to moist.	S-1	0-2	24/24	
	B-1	5-6.5	18/18	
	B-2	10-11.5	18/18	
...grades gravely.				
SHALE: Gray, gypsum along fractures, very close to close spaced fractures, fractures are non-intersecting open planes with intersecting open planes starting at 44 feet, fresh, dry.	B-3	14-15.5	18/18	
		15.5-24.5	108/108	0
				58
...Moderate spaced fractures from 18.5 to 24.5 feet.				33
				100
...Close spaced fractures from 24.5 to 43.5 feet.		24.5-34.5	120/120	25
				100
				0
...Grades wet.				92
				100
				75
				100
				67
		34.5-	96/96	100

Hole diameter is 7.75 inches from 0 to 15.5 feet; and 4.25 inches from 15.5 to 102 feet. Log information from 0 to 42.5 feet obtained from DH-2 log (DH-2 is 38 feet south of MW-2).

DRILL HOLE LOG
DRILL HOLE NO.: MW-2

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: 38 feet north of DH-2
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 25.75'

PROJECT NO.: 2106-003
DATE: 7-12-94
TOC ELEV.:
GS ELEV.: 4338
LOGGED BY: DCH
HOLE NO.: MW-2



ELEVATION / DEPTH	WELL DETAILS	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
					42.5		
			...Close to moderate spaced fractures from 42.5 to 50 feet with very close spaced fractures at 44 feet, dry with occassional wet fractures.		42.5-52	114/114	100 83 100
			...Moderate to wide spaced fractures from 52 to 102 feet with very close spaced fractures at 81.8 feet.		52-62	120/120	92 75 100
					62-72	120/120	

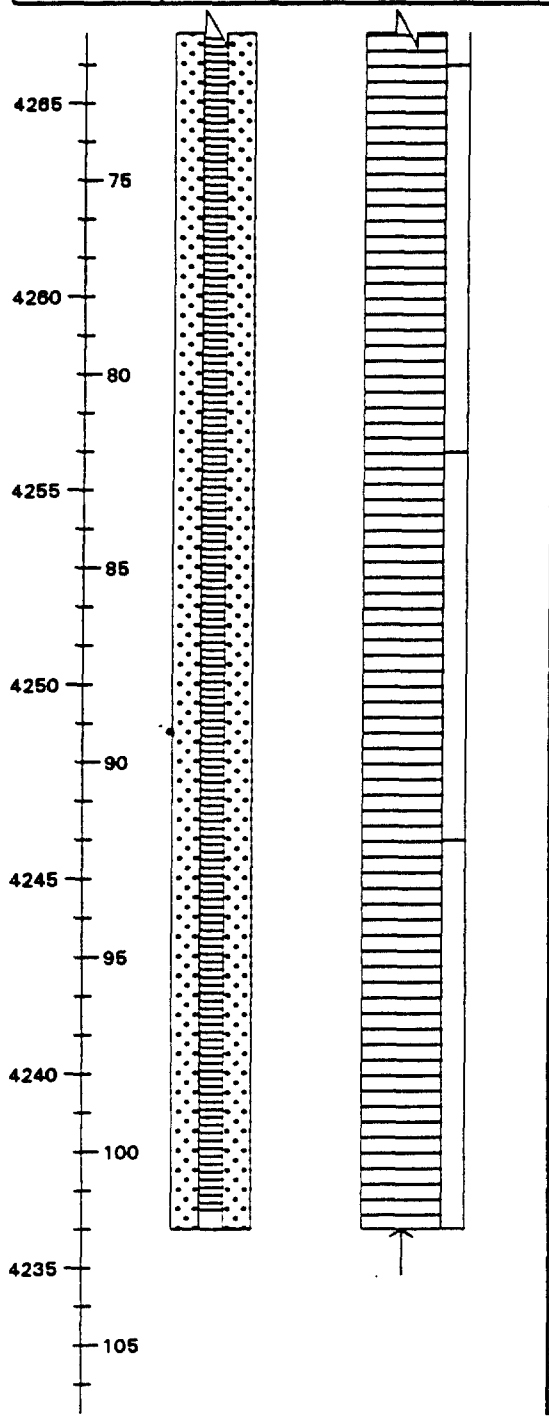
Hole diameter is 7.75 inches from 0 to 15.5 feet; and 4.25 inches from 15.5 to 102 feet. Log information from 0 to 42.5 feet obtained from DH-2 log (DH-2 is 38 feet south of MW-2).

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
DRILL HOLE NO.: MW-2

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: 38 feet north of DH-2
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 25.75'

PROJECT NO.: 2106-003
DATE: 7-12-94
TOC ELEV.:
GS ELEV.: 4338
LOGGED BY: DCH
HOLE NO.: MW-2



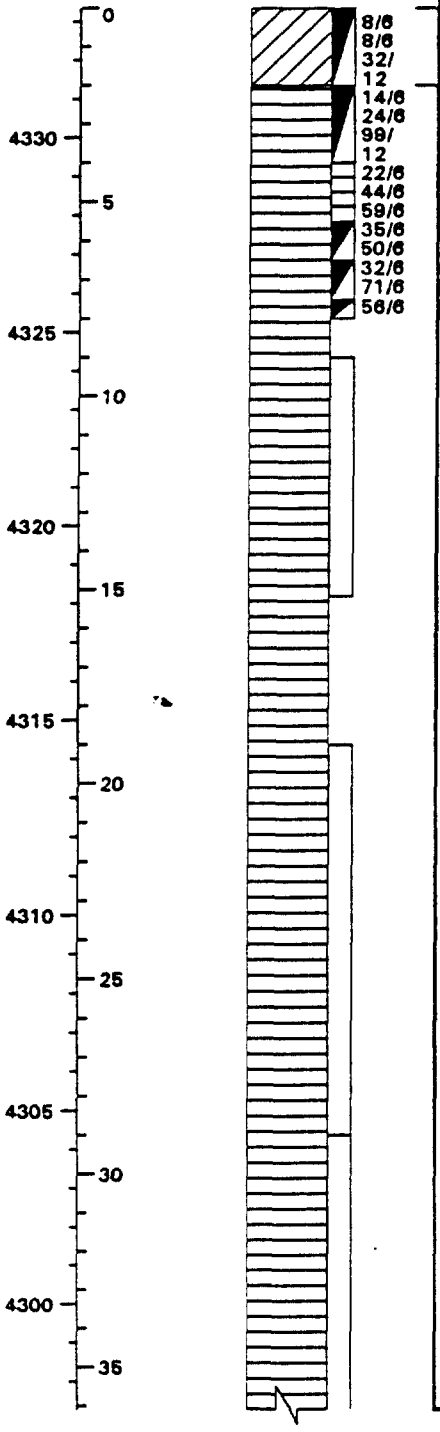
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
		72-82	120/120	
				83
		82-92	120/120	100
		92-102	120/120	

Hole diameter is 7.75 inches from 0 to 15.5 feet; and 4.25 inches from 15.5 to 102 feet. Log information from 0 to 42.5 feet obtained from DH-2 log (DH-2 is 38 feet south of MW-2).

DRILL HOLE LOG
DRILL HOLE NO.: DH-3

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-22-94
TOC ELEV.: NA
GS ELEV.: 4333.36
LOGGED BY: DEW
HOLE NO.: DH-3



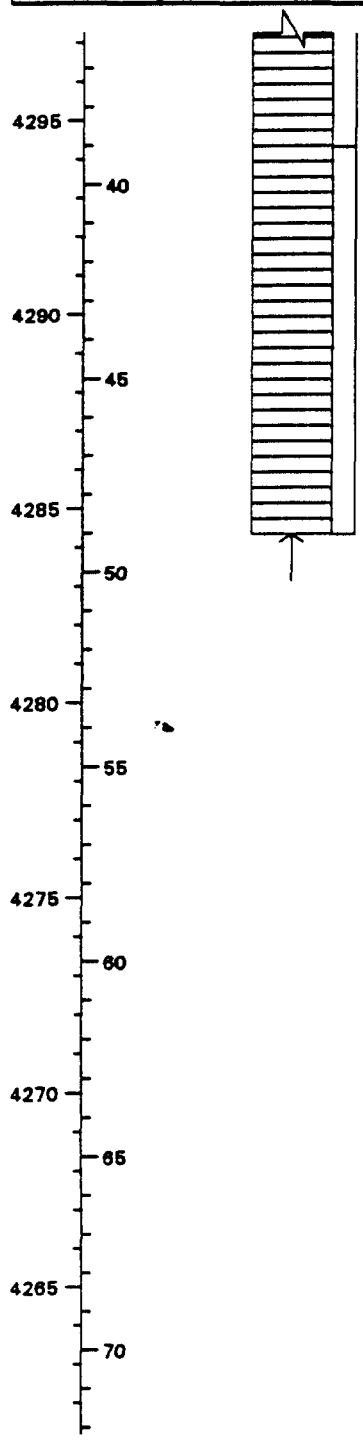
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
[CL] SILTY CLAY: Brown, sandy, roots, very stiff to hard, dry.	B-1	0-2	22/24	
SHALE: Gray, weathered, moderately hard, dry.	B-2	2-4	18/24	
...Gypsum in fractures.	CA-1	4-5.5	18/18	
...Grades hard.	B-3	5.5-6.5	8/12	
	B-4	6.5-7.5	10/12	
	B-5	7.5-8	6/6	
(Began coring at 9 feet.) ...Silt in fractures, very close spaced factures, fractures are non-intersecting open planes, fresh, dry.		9-16.2	74/74	0
...Shattered fractures from 13 to 16.2 feet. ...Gypsum in fractures from 14 to 35 feet				
...Very close spaced fractures from 19 to 35 feet.		19-29	96/120	33
...fractures are non-intersecting and intersecting open planes from 21 to 49 feet.				0
				33
				0
...Core slightly damp		29-39	120/120	0
				42
...Moderate spaced fractures from 35 to 39 feet.				100

Hole diameter is 7.75 inches form 0 to 9 feet; and 4.25 inches from 9 to 49 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-3

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-22-94
TOC ELEV.: NA
GS ELEV.: 4333.36
LOGGED BY: DEW
HOLE NO.: DH-3



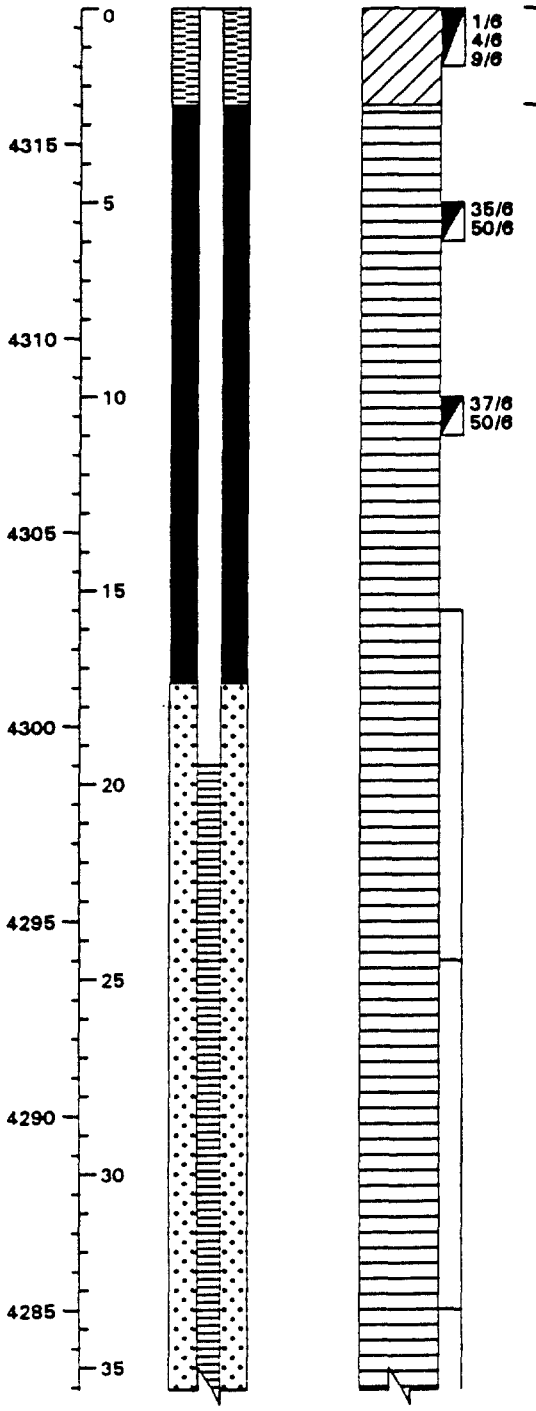
ELEVATION / DEPTH	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
		...Close spaced fractures from 39 to 49 feet.		39-49	120/120	100 67 50 67 42 33 100

Hole diameter is 7.75 inches form 0 to 9 feet; and 4.25 inches from 9 to 49 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-4

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 6-21-94
TOC ELEV.: 4321.46
GS ELEV.: 4318.51
LOGGED BY: DEW
HOLE NO.: MW-4



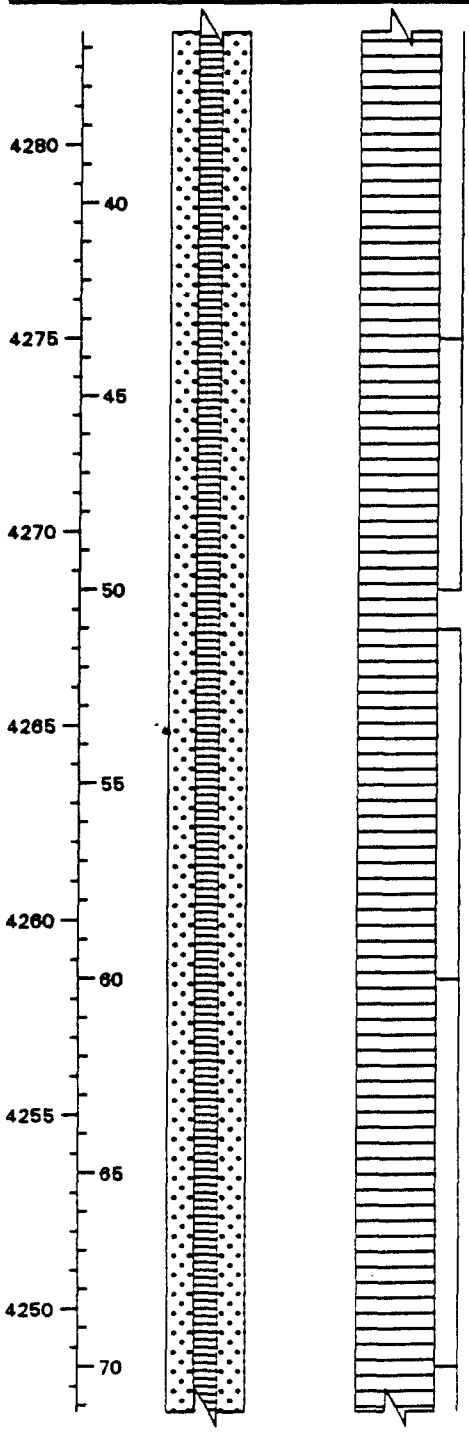
ELEVATION / DEPTH	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
	[CL] SILTY CLAY: Brown, roots, sandy, stiff, dry. ...Grades gravely.	B-1	0-1.5	7/18	
	SHALE: Gray, moderately hard to hard, dry. ...Gypsum in fractures.	B-2	5-6	10/12	
	...grades hard.	B-3	10-11	10/12	
	(Began coring at 15.5 feet.) ...Gypsum in fractures, very close to close spaced fractures, fractures are non-intersecting open planes with intersecting open planes at 40 feet, slightly weathered to fresh, dry.		15.5-24.5	120/120	0
					92
					67
					58
	...Moderate spaced fractures from 24.5 to 50 feet, damp.		24.5-33.5	108/108	50
					100
	...Grades moist.		33.5-43.5	120/120	

Hole diameter is 7.75 inches from 0 to 15.5 feet; and 4.25 inches from 15.5 to 50 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-4

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 6-21-94
TOC ELEV.: 4321.46
GS ELEV.: 4318.51
LOGGED BY: DEW
HOLE NO.: MW-4



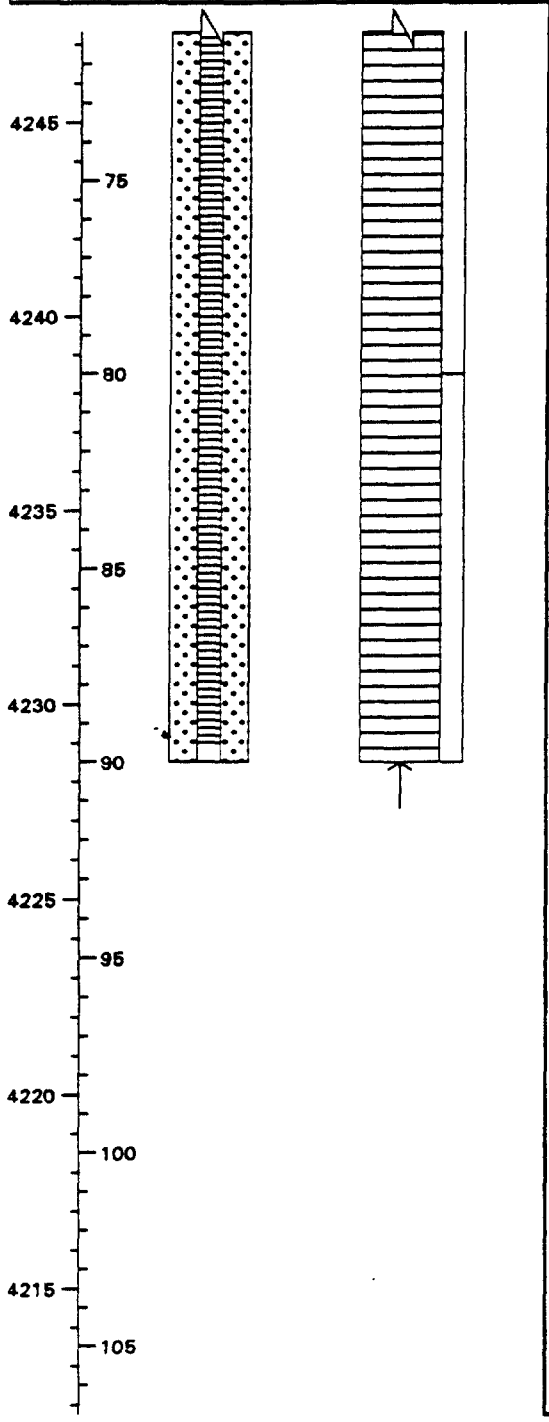
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
		43.5-50	78/78	
...Fractures are spaced wide from 50 to 65 feet, fractures are non-intersecting planes from 51 to 90 feet.		51-60	108/108	
		60-70	120/120	92
...Fractures and spaced very wide.		70-80	120/120	100

Hole diameter is 7.75 inches from 0 to 15.5 feet; and 4.25 inches from 15.5 to 50 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-4

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 6-21-94
TOC ELEV.: 4321.46
GS ELEV.: 4318.51
LOGGED BY: DEW
HOLE NO.: MW-4



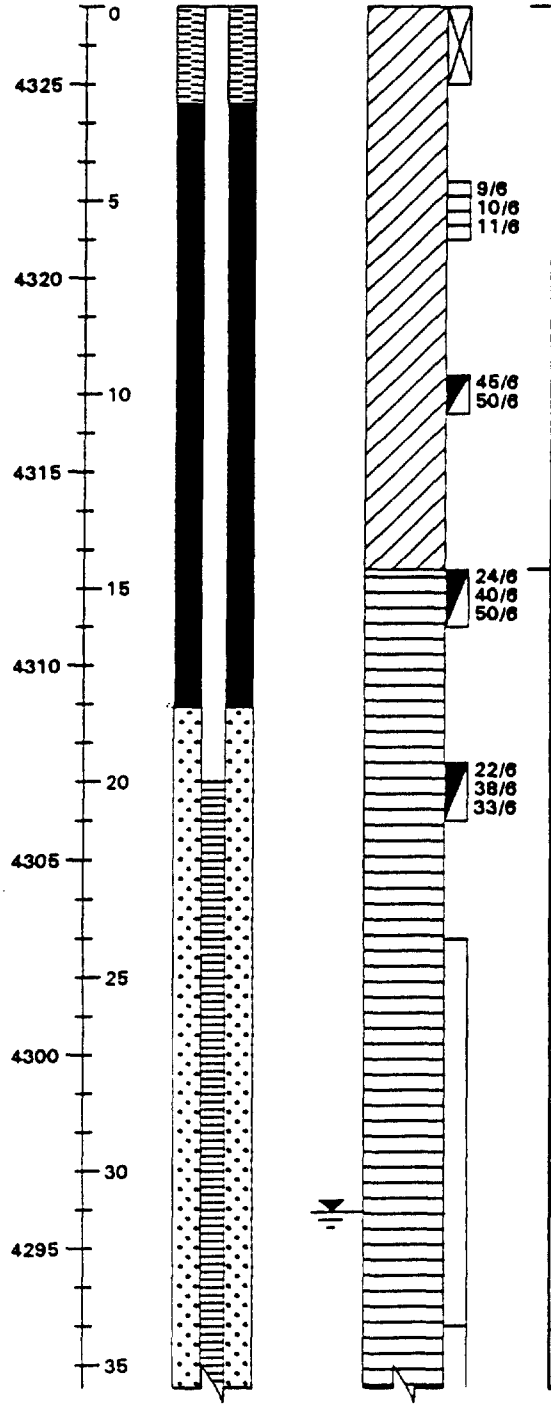
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
		80-90	120/120	92
				100

Hole diameter is 7.75 inches from 0 to 15.5 feet; and 4.25 inches from 15.5 to 50 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-5

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 31.05'

PROJECT NO.: 2106-003
DATE: 6-30-94
TOC ELEV.:
GS ELEV.: 4327
LOGGED BY: DCH
HOLE NO.: MW-5



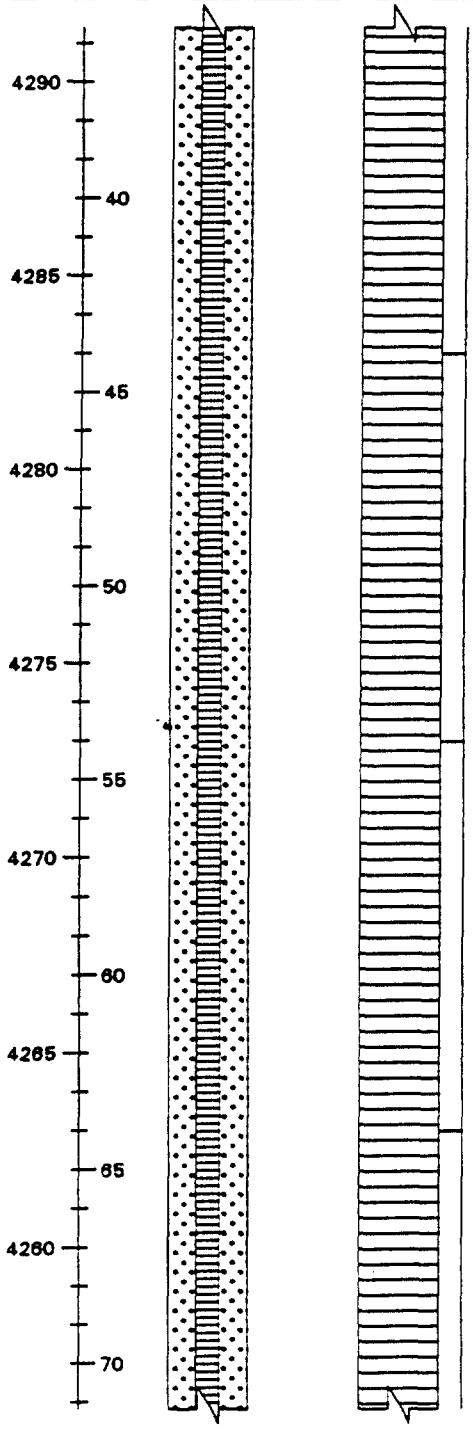
ELEVATION / DEPTH	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
	[CL] SILTY CLAY: Brown, slightly sandy, very stiff to hard, dry.	S-1	0-2	24/24	
		CA-2	4.5-6	14/16	
		B-3	9.5-10.5	8/12	
	SHALE: Gray, very weathered, moderately hard, dry.	B-4	14.5-16	14/18	
		B-5	19.5-21	13/18	
	(Began coring at 24 feet.) ...Gypsum along some fractures, fractures shattered to close spaced fractures from 24 to 29 feet & lose to moderate spaced fractures from 29 to 54 feet, fractures are non-intersecting and intersecting open planes, slightly weathered to fresh, dry to moist.		24-34	120/120	67 33 50 100 75 100
	...Grades wet.		34-44	120/120	

Hole diameter is 7.75 inches from 0 to 24 feet; and 4.25 inches from 24 to 139 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-5

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 31.05'

PROJECT NO.: 2106-003
DATE: 6-30-94
TOC ELEV.:
GS ELEV.: 4327
LOGGED BY: DCH
HOLE NO.: MW-5



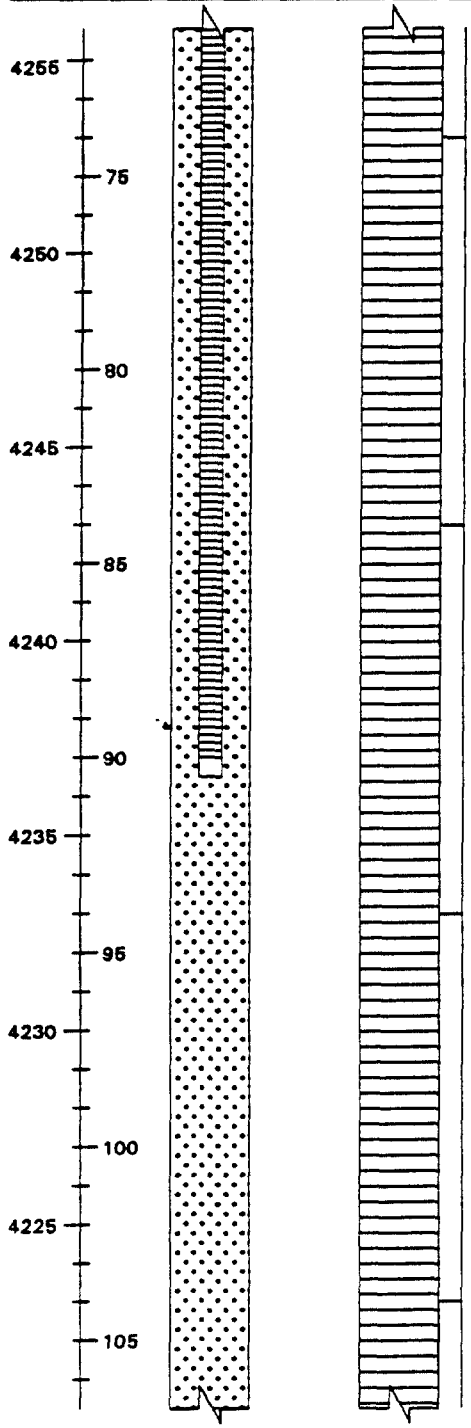
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
				33
				100
				83
...Occasional shattered to very close spaced fractures.		44-54	120/120	50
				92
				100
				92
				100
				92
				75
...Very close to close spaced fractures.		54-64	120/120	100
				75
				67
				58
				100
				75
...Close to moderate with occasional very close spaced farctures from 64 to 84 feet.		64-74	120/120	100
				58
				100

Hole diameter is 7.75 inches from 0 to 24 feet; and 4.25 inches from 24 to 139 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-5

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 31.05'

PROJECT NO.: 2106-003
DATE: 6-30-94
TOC ELEV.:
GS ELEV.: 4327
LOGGED BY: DCH
HOLE NO.: MW-5



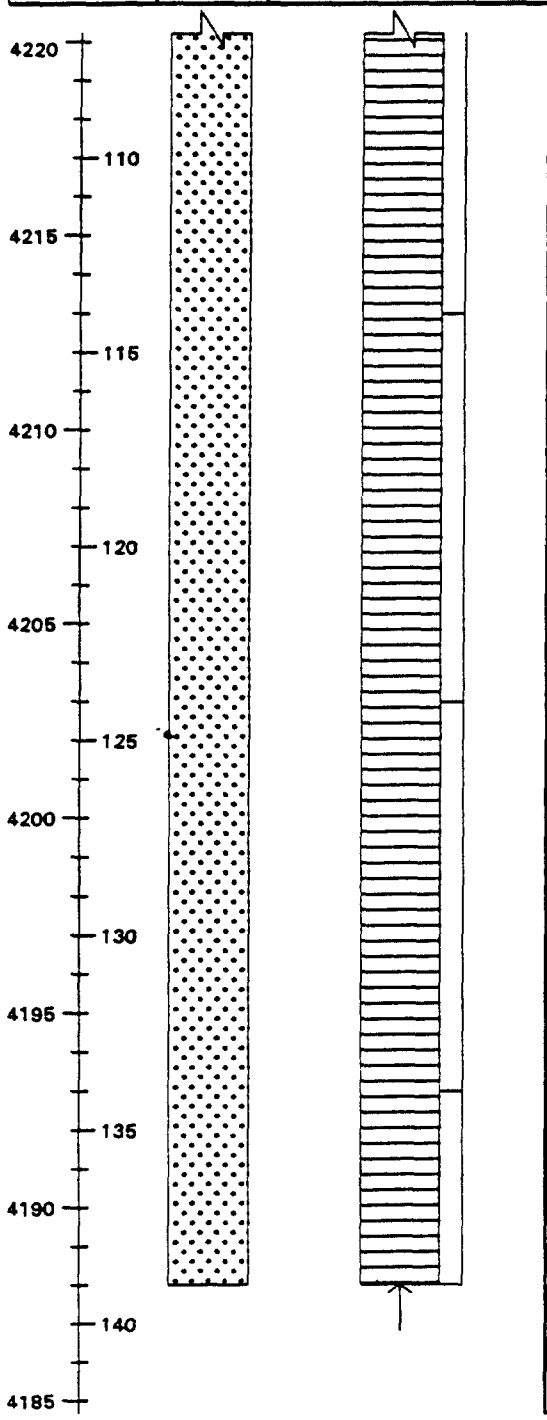
ELEVATION / DEPTH	WELL DETAILS	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
							92
							75
							100
					74-84	120/120	50
							100
							42
							50
							67
							92
							75
							100
					84-94	120/120	75
							100
							83
			...Moderate to wide spaced fractures from 84 to 139.5 feet.				100
					94-104	120/120	
					104-114	120/120	

Hole diameter is 7.75 inches from 0 to 24 feet; and 4.25 inches from 24 to 139 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-5

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 31.05'

PROJECT NO.: 2106-003
DATE: 6-30-94
TOC ELEV.:
GS ELEV.: 4327
LOGGED BY: DCH
HOLE NO.: MW-5



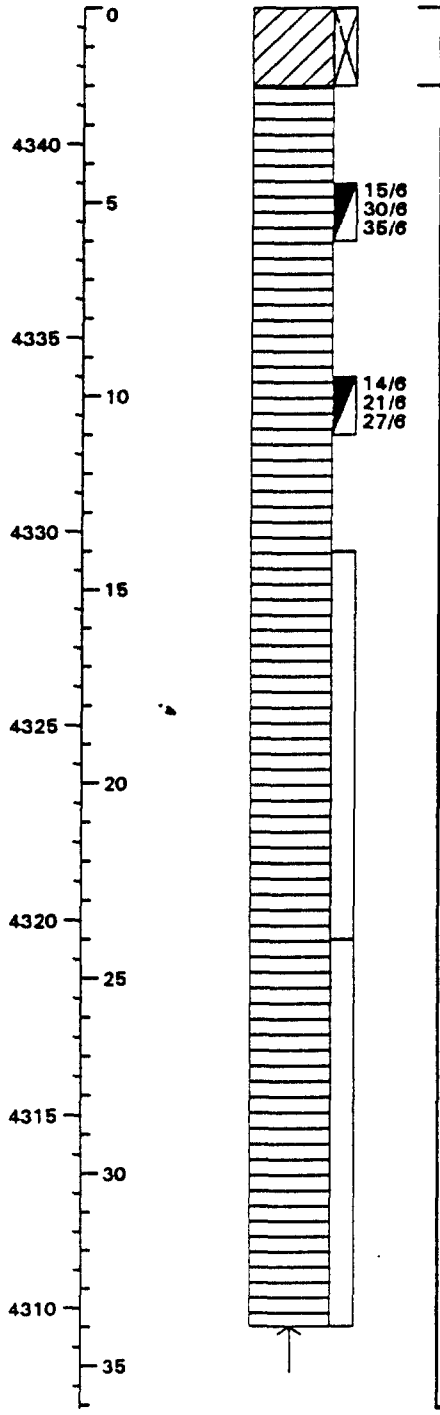
ELEVATION / DEPTH	WELL DETAILS	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
					114-124	120/120	
					124-134	120/120	
					134-139	60/60	

Hole diameter is 7.75 inches from 0 to 24 feet; and 4.25 inches from 24 to 139 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-6

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-23-94
TOC ELEV.: NA
GS ELEV.: 4343.51
LOGGED BY: DEW
HOLE NO.: DH-6



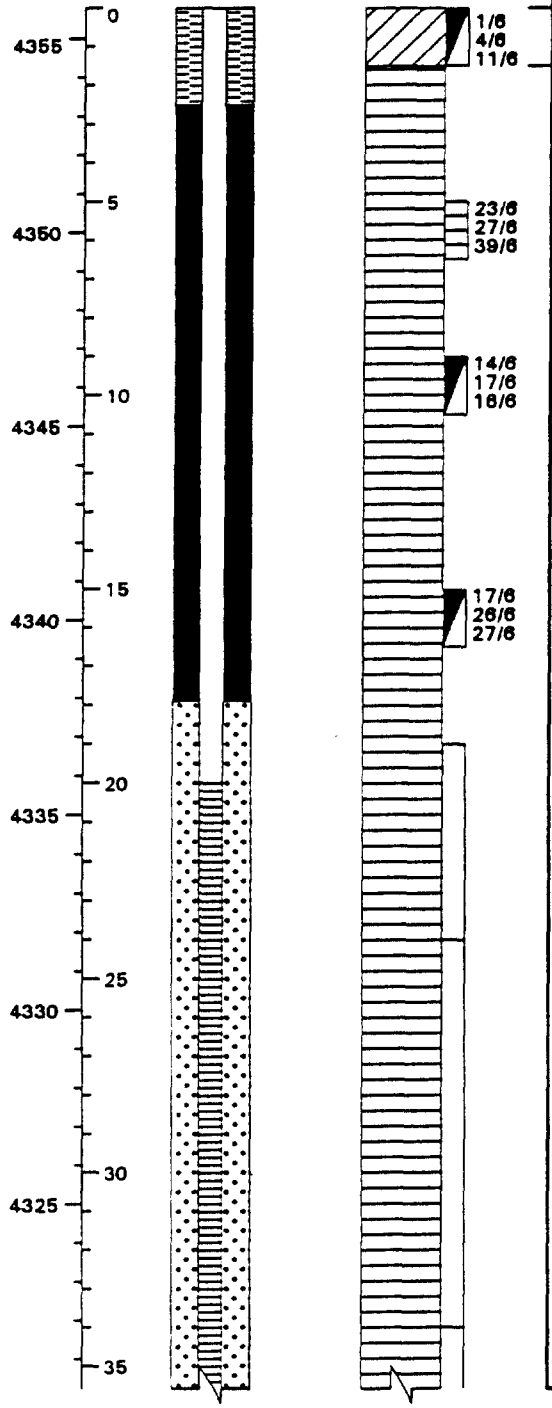
ELEVATION / DEPTH	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
	[CL] SILTY CLAY: Brown, sandy, stiff, dry.	S-1	0-2	24/24	
	SHALE: Gray, weathered, firm to moderately hard, dry.				
		B-1	4.5-6	16/18	
		B-2	9.5-11	16/18	
	...Grades hard.				
	(Began coring at 14 feet)				
	...very close to moderate spaced fractures fractures are non-intersecting and intersecting open planes, slightly weathered ts fresh, dry.		14-24	116/120	0
					42
	...Fractures are non-intersecting open planes from 17 to 34 feet.				0
					100
			24-34	120/120	

Hole diameter is 7.75 inches from 0 to 14 feet; and 4.25 inches from 14 to 34 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-7

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 6-23-94
TOC ELEV.: 4358.65
GS ELEV.: 4355.81
LOGGED BY: DEW
HOLE NO.: MW-7



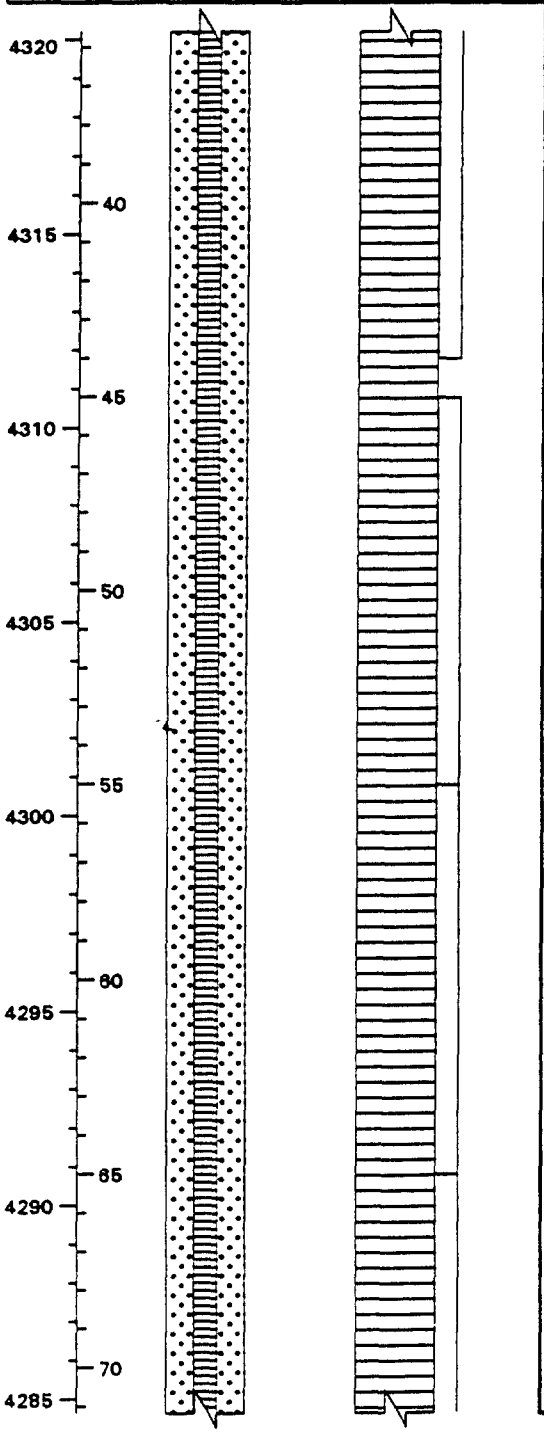
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
[CL] SILTY CLAY: Brown, slightly sandy, stiff, dry.	B-1	0-1.5	16/18	
SHALE: Gray, firm to moderately hard, dry.				
	CA-1	5-6.5	18/18	
	B-2	9-10.5	16/18	
...Gypsum in fractures.	B-3	15-16.5	16/18	
(Began coring at 19 feet) ...very close spaced fractures, fractures are non-intersecting and intersecting open planes, slightly weathered to fresh, dry.		19-24	56/60	0
...Close to moderate spaced fractures from 24 to 34 feet.		24-34	120/120	33 67 100
...Wide spaced fractures from 34 to 44 feet.		34-44	120/120	92 100

Hole diameter is 7.75 inches from 0 to 19 feet; and 4.25 inches from 19 to 85 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-7

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 6-23-94
TOC ELEV.: 4358.65
GS ELEV.: 4355.81
LOGGED BY: DEW
HOLE NO.: MW-7



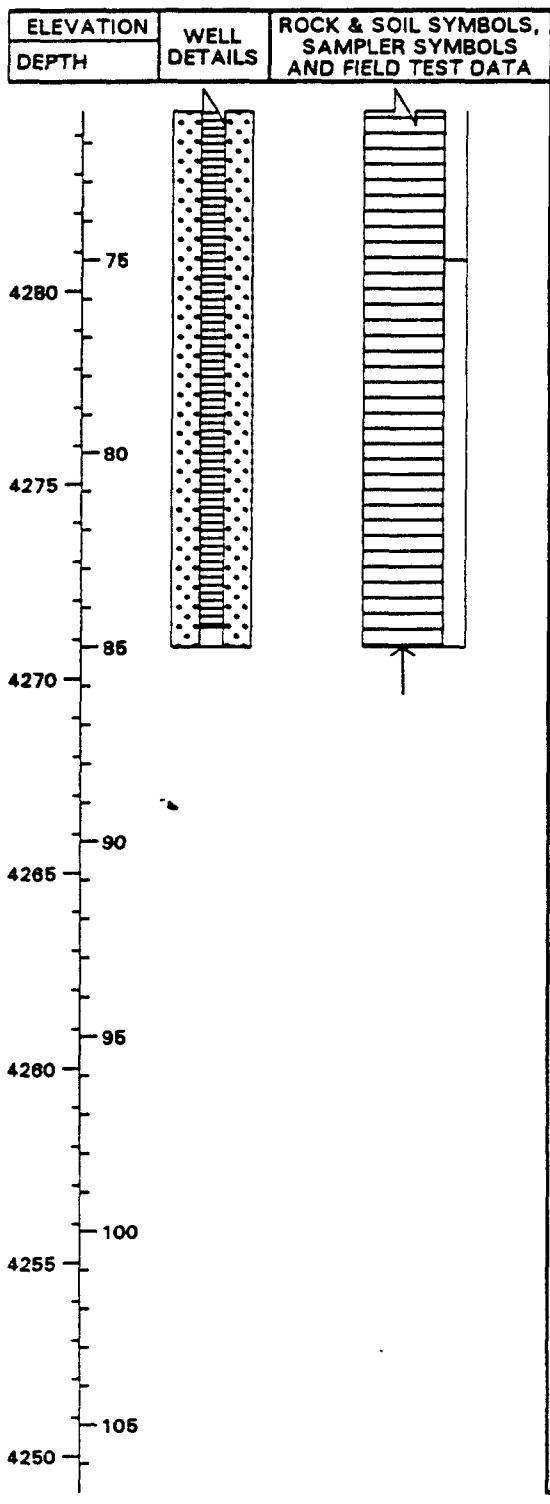
ELEVATION / DEPTH	WELL DETAILS	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	ROD (%)
			...Grades wet.				
			...Grades dry.		45-55	120/120	0
							100
					55-65	120/120	
							75
							100
							75
							42
							100
					65-75	120/120	0
							92
							100

Hole diameter is 7.75 inches from 0 to 19 feet; and 4.25 inches from 19 to 85 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-7

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 6-23-94
TOC ELEV.: 4358.65
GS ELEV.: 4355.81
LOGGED BY: DEW
HOLE NO.: MW-7



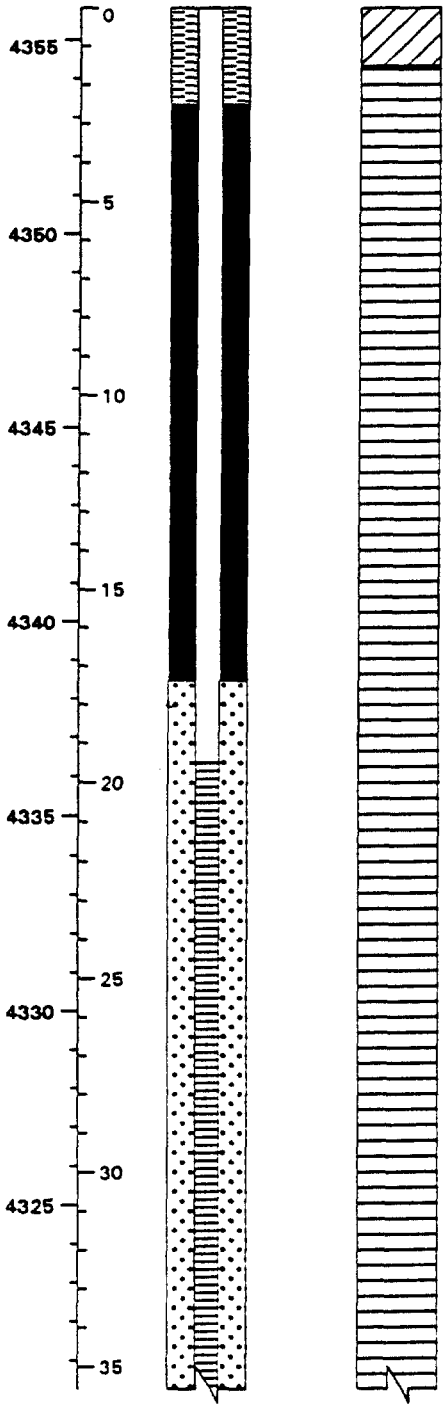
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
		75-85	120/120	83 100

Hole diameter is 7.75 inches from 0 to 19 feet; and 4.25 inches from 19 to 85 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-7A

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill. L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 6-23-94
TOC ELEV.: 4358.67
GS ELEV.: 4355.84
LOGGED BY: DEW
HOLE NO.: MW-7A



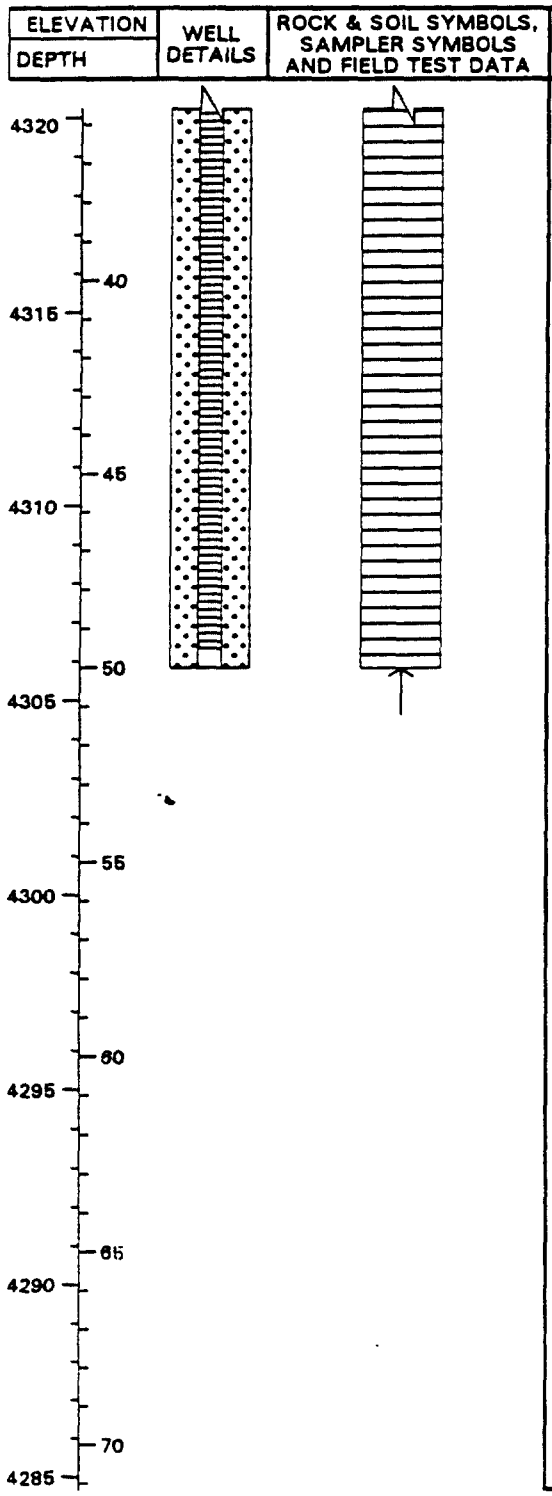
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
[CL] SILTY CLAY: Brown, slighlty sandy, stiff, dry.				
SHALE: Gray, firm to moderately hard, dry.				
...Gypsum in fractures.				
...very close spaced fractures, fractures are non-intersecting and intersecting open planes, slightly weathered to fresh, dry.				
...Close to moderate spaced fractures from 24 to 34 feet.				
...Wide spaced fractures from 34 to 44 feet.				

Hole diameter is 7.75 inches from 0 to 19 feet; and 4.25 inches from 19 to 85 feet. Log information obtained from MW-7 located 15 feet west of MW-7A.

DRILL HOLE LOG
DRILL HOLE NO.: MW-7A

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill, L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 6-23-94
TOC ELEV.: 4358.67
GS ELEV.: 4355.84
LOGGED BY: DEW
HOLE NO.: MW-7A



Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)

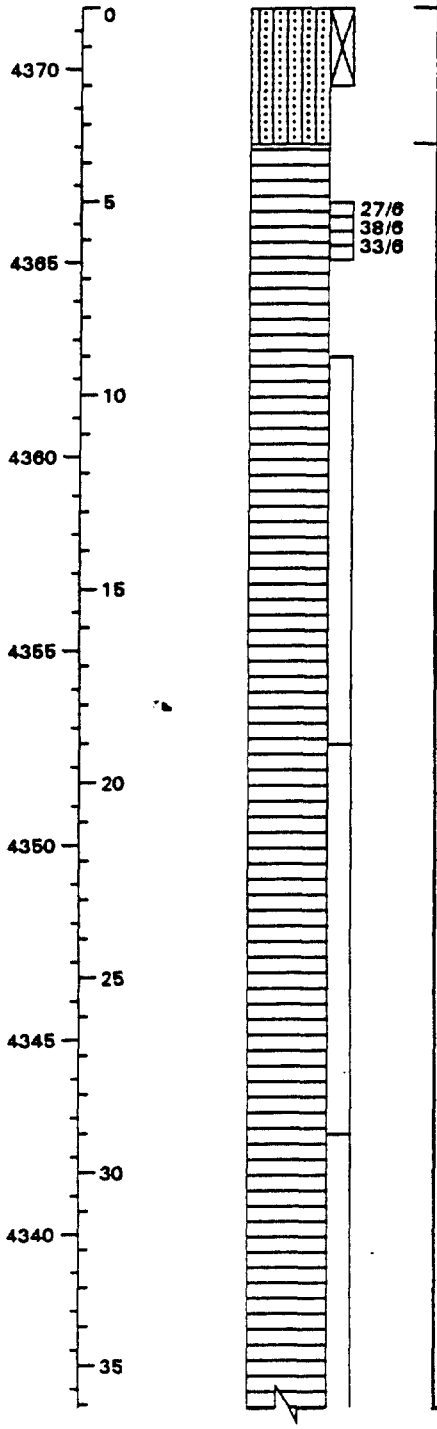
Hole diameter is 7.75 inches from 0 to 19 feet; and 4.25 inches from 19 to 85 feet. Log information obtained from MW-7 located 15 feet west of MW-7A.

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
DRILL HOLE NO.: DH-8

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-24-94
TOC ELEV.: NA
GS ELEV.: 4371.59
LOGGED BY: DEW
HOLE NO.: DH-8



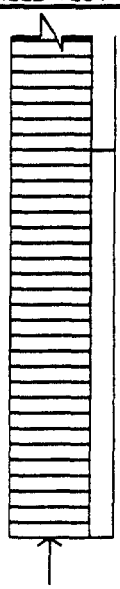
ELEVATION / DEPTH	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
		[SM] SILTY SAND: Brown, roots, clayey, medium dense, dry.	S-1	0-2	22/24	
		SHALE: Gray, gypsum, firm to moderately hard, dry.	CA-1	5-6.5	18/18	
		(Began coring at 9 feet.) ...Gypsum along fractures, shattered to very close spaced fractures, fractures are intersecting and non-intersecting open planes, highly to moderately weathered, dry.		9-19	90/120	0
		...Close to moderate spaced factures, non-intersecting open planes.		19-29	116/120	
		...Weathering grades to fresh.				33
						83
						58
						0
						100
				29-39	120/120	

Hole diameter is 7.75 inches from 0 to 9 feet; and 4.25 inches form 9 to 49 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-8

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-24-94
TOC ELEV.: NA
GS ELEV.: 4371.59
LOGGED BY: DEW
HOLE NO.: DH-8

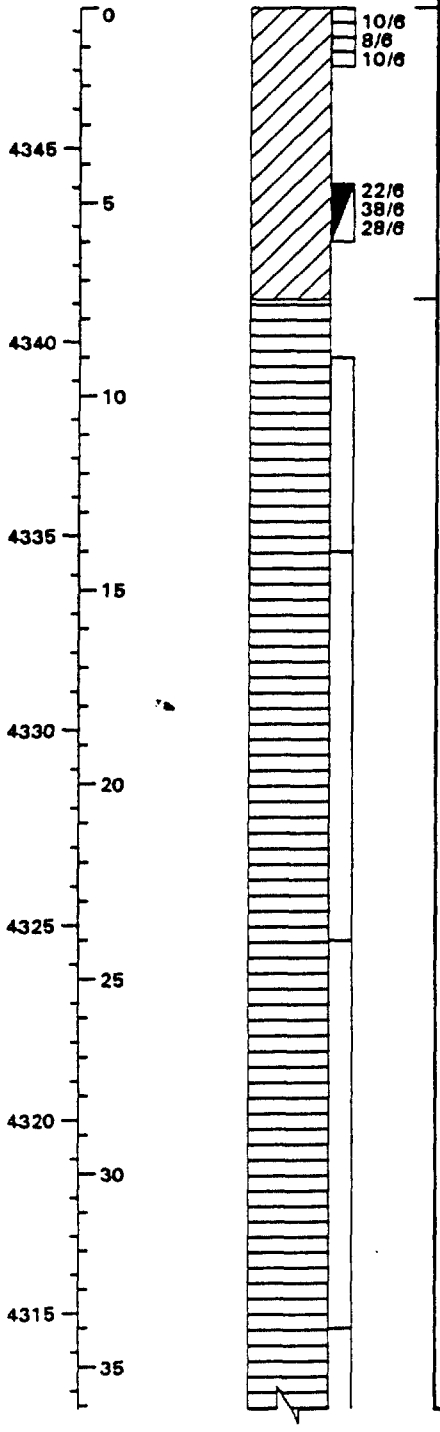
ELEVATION / DEPTH	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
4335				39-49	120/120	67
40						100
4330						83
45						100
4325						
50						
4320						
55						
4315						
60						
4310						
65						
4305						
70						
4300						

Hole diameter is 7.75 inches from 0 to 9 feet; and 4.25 inches form 9 to 49 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-9

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-29-94
TOC ELEV.: NA
GS ELEV.: 4348.61
LOGGED BY: DCH
HOLE NO.: DH-9



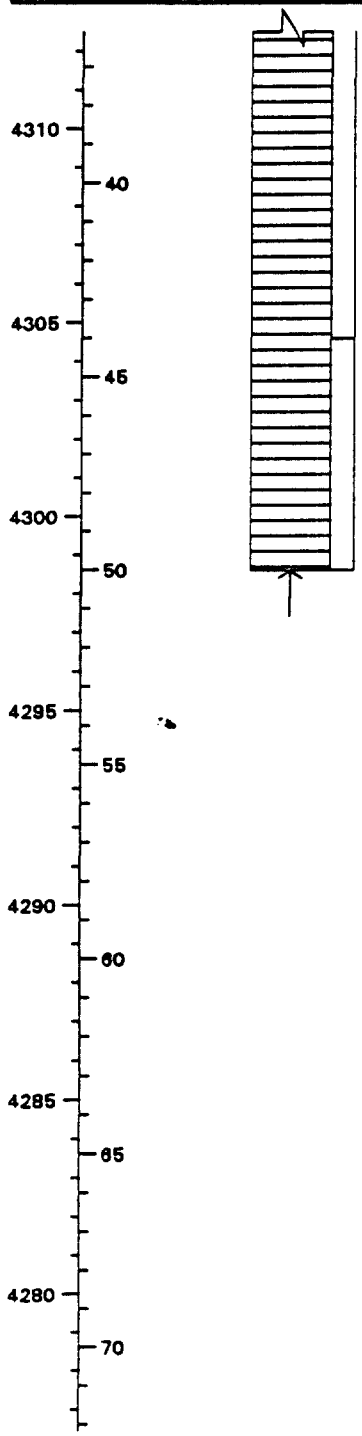
ELEVATION / DEPTH	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
	[CL] SILTY CLAY: Brown, roots, sandy, very stiff to hard, dry.	CA-1	0-1.5	12/18	
		B-2	4.5-6	15/18	
	SHALE: Gray, weathered, firm to hard, dry. (Began coring at 9 feet.)				
	...Gypsum along fractures, very close to close spaced fractures with with occasional shattered fractures, fractures are non-intersecting and intersecting open planes, lightly weathered to fresh, dry.		9-14	48/60	33
					67
					33
					0
			14-24	109/120	
					33
	...Moderate spaced fractures from 18 to 34 feet.				100
			24-34	120/120	
	...Very close to close spaced fractures from 34 to 44 feet.		34-44	120/120	

Hole diameter is 7.75 inches from 0 to 9 feet; and 4.25 inches from 9 to 50 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-9

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-29-94
TOC ELEV.: NA
GS ELEV.: 4348.61
LOGGED BY: DCH
HOLE NO.: DH-9



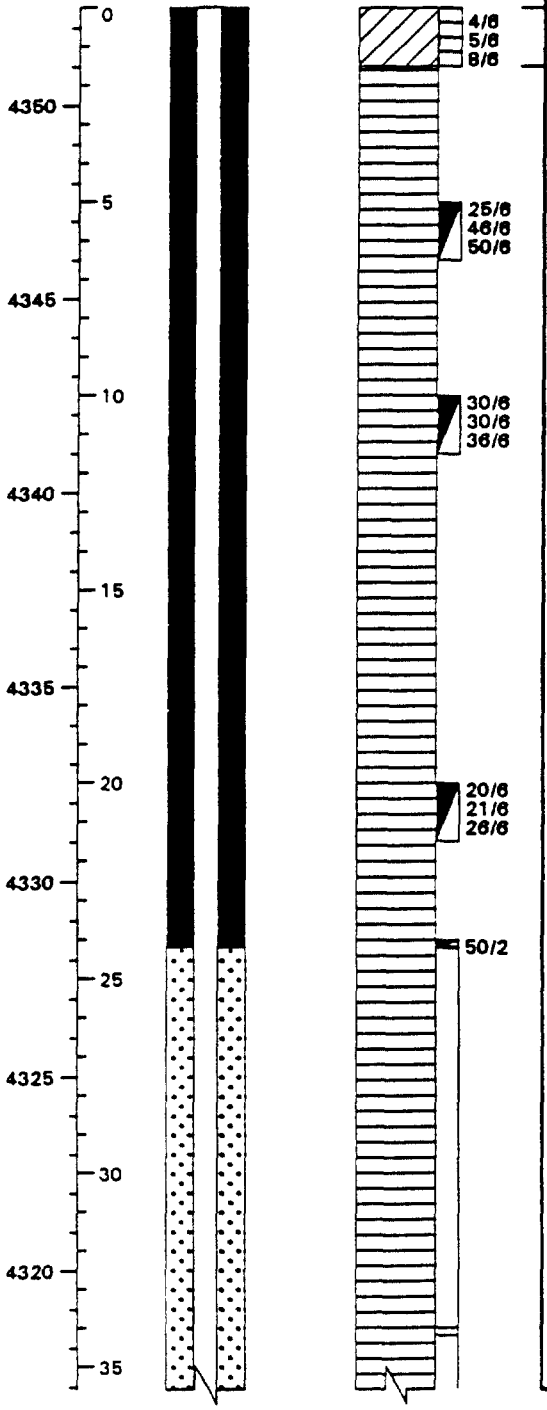
ELEVATION / DEPTH	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
						75
						100
						92
						100
						75
		...Close to moderately spaced fractures from 44 to 50 feet.		44-50	72/72	0
						100
						75
						92
						75
						100

Hole diameter is 7.75 inches from 0 to 9 feet; and 4.25 inches from 9 to 50 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-10

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 37.42'

PROJECT NO.: 2106-002
DATE: 6-27-94
TOC ELEV.: 4353.83
GS ELEV.: 4352.53
LOGGED BY: DEW
HOLE NO.: DH-10



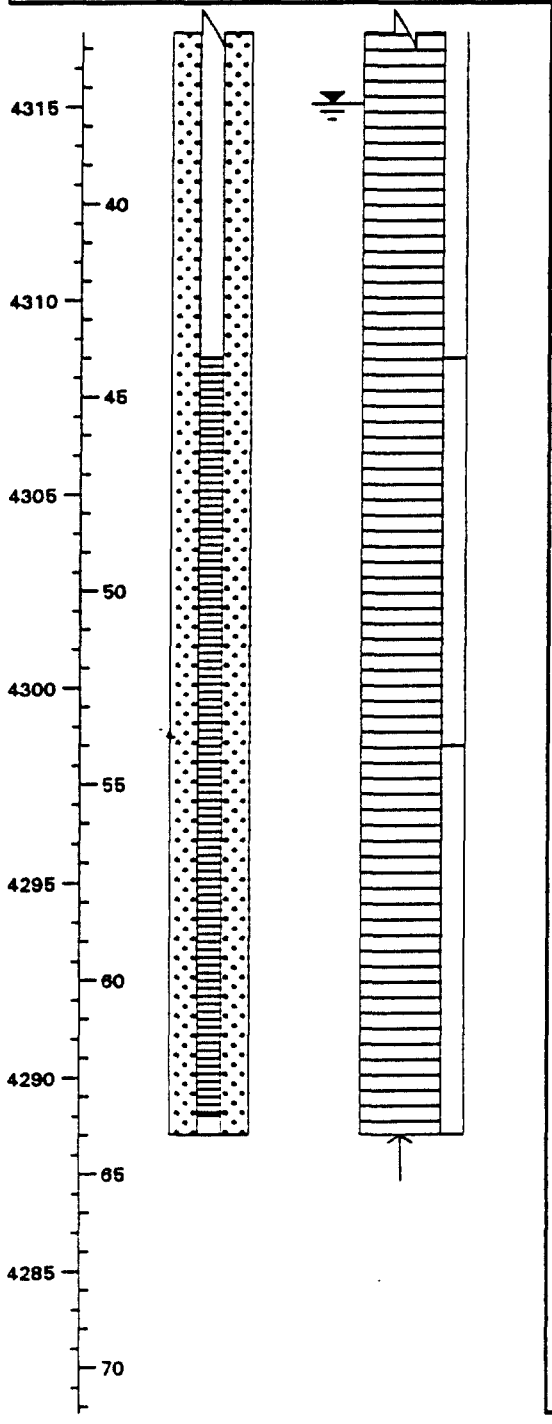
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
[CL] SILTY CLAY: Brown, roots, sandy, stiff, dry.	CA-1	0-1.5	18/18	
SHALE: Gray, very to moderately weathered, moderately hard, dry.				
	B-1	5-6.5	18/18	
...Gypsum in fractures.	B-2	10-11.5	17/18	
	B-3	20-21.5	18/18	
(Began coring at 24 feet.)	B-4	24-24.2	18/18	
...very close to close spaced fractures, fractures are intersecting and non-intersecting open planes, slightly weathered to fresh, dry.		24.2-34	120/120	0 43 0 67 0 43 100 33 100
		34-44	120/120	

Hole diameter is 7.75 inches from 0 to 24 feet; and 4.25 inches from 24 to 64 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-10

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: 37.42'

PROJECT NO.: 2106-002
DATE: 6-27-94
TOC ELEV.: 4353.83
GS ELEV.: 4352.53
LOGGED BY: DEW
HOLE NO.: DH-10



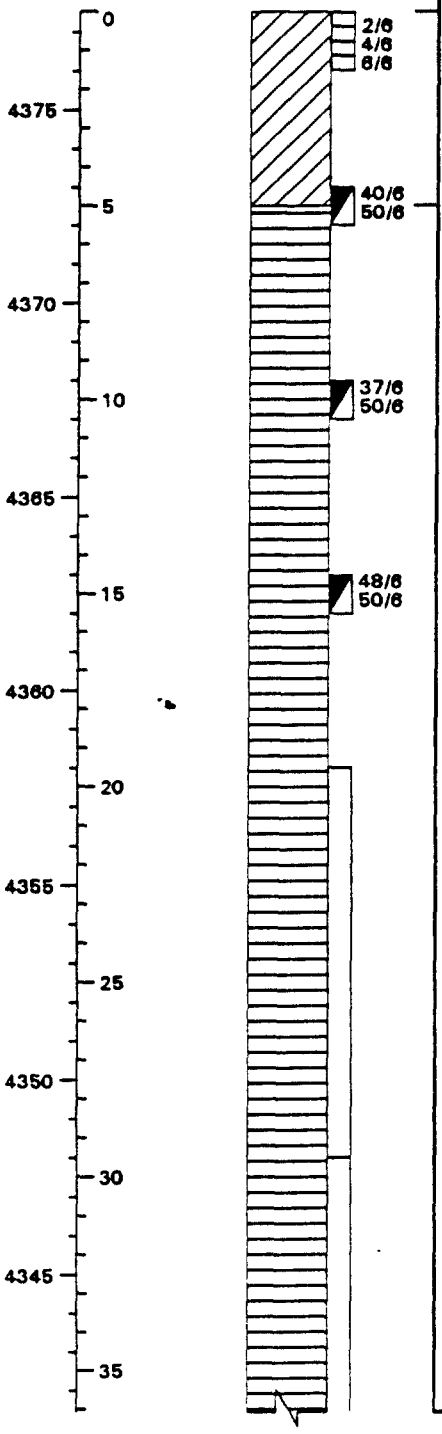
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
				83
				92
				100
...Grades wet. ...Moderate spaced fractures with occasional shattered fractures.		44-54	120/120	75
				100
				33
				67
				100
		54-64	120/120	67
				100
				92
				100

Hole diameter is 7.75 inches from 0 to 24 feet; and 4.25 inches from 24 to 64 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-12

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-24-94
TOC ELEV.: NA
GS ELEV.: 4377.53
LOGGED BY: DEW
HOLE NO.: DH-12



ELEVATION / DEPTH	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
	[CL] SILTY CLAY: Brown, sandy, stiff, dry.	CA-1	0-1.5	18/18	
	...Boulder approximatly 1.5 feet thick.				
	SHALE: Grayish tan, very to moderately weathered, moderately hard, dry.	B-2	4.5-5.5	12/12	
		B-3	9.5-10.5	12/12	
		B-4	14.5-15.5	12/12	
	(Began coring at 19.5 feet.) ...Gray, close to moderate spaced fractures, fractures are non-intersecting to intersecting open planes, slightly weathered to fresh, moist.		19.5-29.5	120/120	100
					75
					100
					75
					100
	...Moderate to wide spaced fractures from 29.5 to 49.5 feet with very close spaced fractures at 20 to 20.5 feet, dry.		29.5-39.5	120/120	50
					100

Hole diameter is 7.75 inches from 0 to 19.5 feet; and 4.25 inches from 19.5 to 49.5 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-12

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-24-94
TOC ELEV.: NA
GS ELEV.: 4377.53
LOGGED BY: DEW
HOLE NO.: DH-12

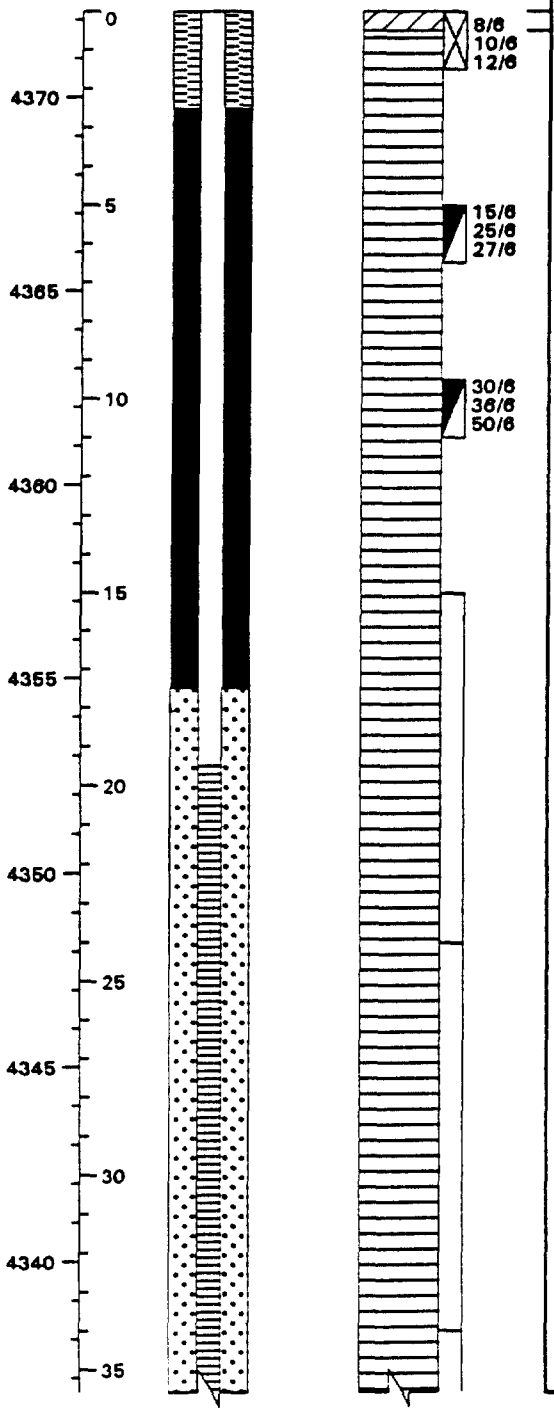
ELEVATION / DEPTH	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
4340 / 40				39.5-49.5	120/120	58 75 100
4335 / 45						
4330 / 50						
4325 / 55						
4320 / 60						
4315 / 65						
4310 / 70						

Hole diameter is 7.75 inches from 0 to 19.5 feet; and 4.25 inches from 19.5 to 49.5 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-13

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 7-19-94
TOC ELEV.: 4375.10
GS ELEV.: 4372.22
LOGGED BY: DCH
HOLE NO.: MW-13



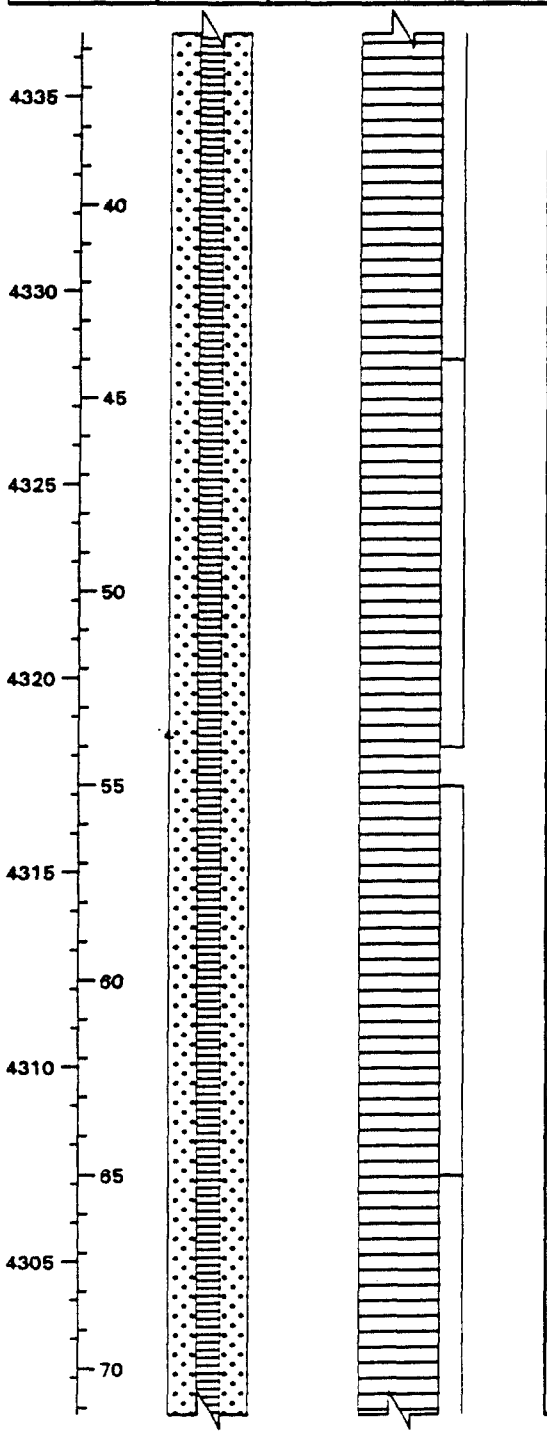
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
[CL] SILTY CLAY: Brown, sandy, roots, very stiff, dry.	CA-1	0-1.5	16/18	
SHALE: Grayish tan, gypsum in fractures, very to moderately weathered, moderatly hard, dry.				
	B-2	5-6.5	12/18	
	B-3	9.5-11	12/18	
(Began coring at 15 feet.)				
...gypsum along some fractures, very close to close spaced fractures with occasional shattered fractures, fractures are non-intersecting and intersecting open planes, slightly weathered to fresh, dry.		15-24	108/108	33 42 33 0 100 33 50
...grades wet.		24-34	120/120	0 100 42 100
...Grades dry.		34-44	120/120	

Hole diameter is 7.75 inches from 0 to 15 feet; and 4.25 inches from from 15 to 100 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-13

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 7-19-94
TOC ELEV.: 4375.10
GS ELEV.: 4372.22
LOGGED BY: DCH
HOLE NO.: MW-13



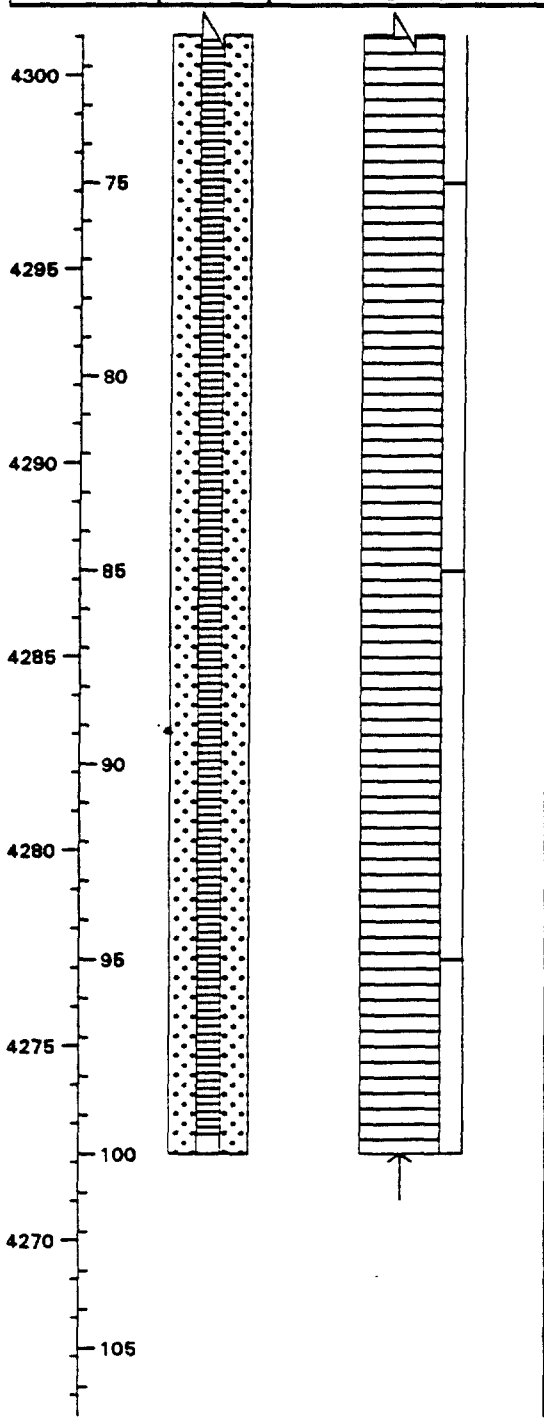
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
				0
				100
				75
				50
				67
				100
				50
				100
...Close to moderate spaced fractures from 44 to 49 feet & very close to close spaced fractures from 49 to 54 feet.		44-54	120/120	
				92
...Moderate to wide spaced fractures from 55 to 95 feet.		55-65	120/120	100
				83
				100
		65-75	120/120	83
				100
				58

Hole diameter is 7.75 inches from 0 to 15 feet; and 4.25 inches from from 15 to 100 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-13

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 7-19-94
TOC ELEV.: 4375.10
GS ELEV.: 4372.22
LOGGED BY: DCH
HOLE NO.: MW-13



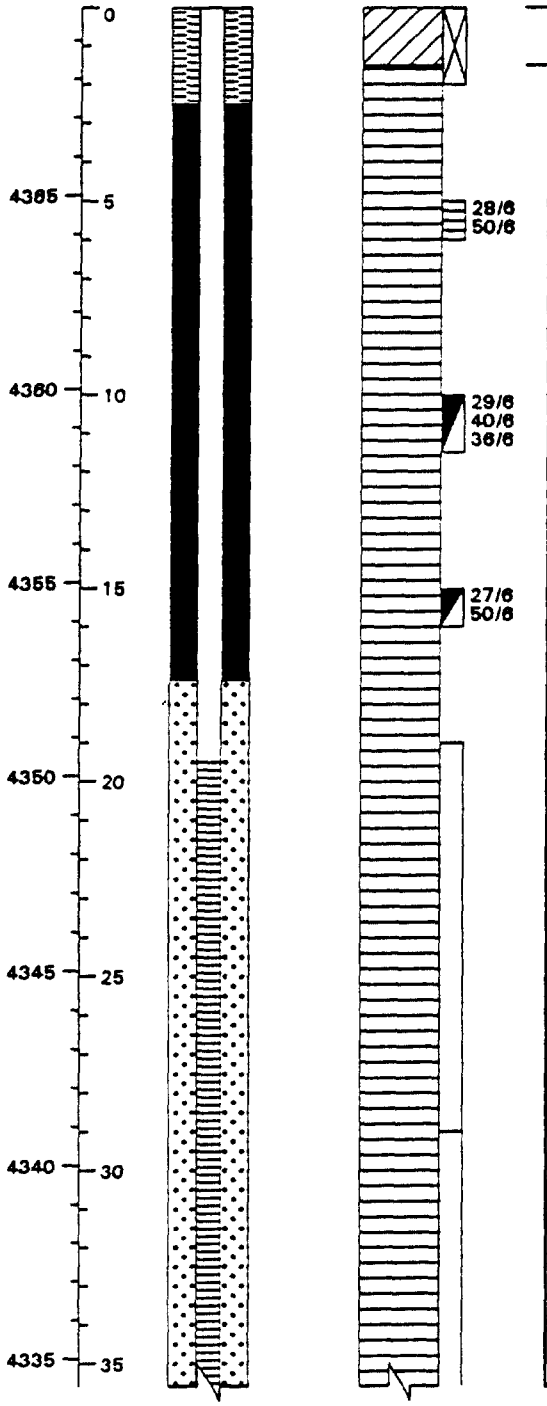
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
				100
...Grades with very moist & wet zones from 75 to 100 feet.		75-85	120/120	
...Close spaced fractures from 80.8 to 81.1 feet.				50
				100
		85-95	120/120	42
				100
				83
		95-100	60/60	

Hole diameter is 7.75 inches from 0 to 15 feet; and 4.25 inches from from 15 to 100 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-14

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 7-15-94
TOC ELEV.: 4372.77
GS ELEV.: 4369.86
LOGGED BY: DCH
HOLE NO.: MW-14



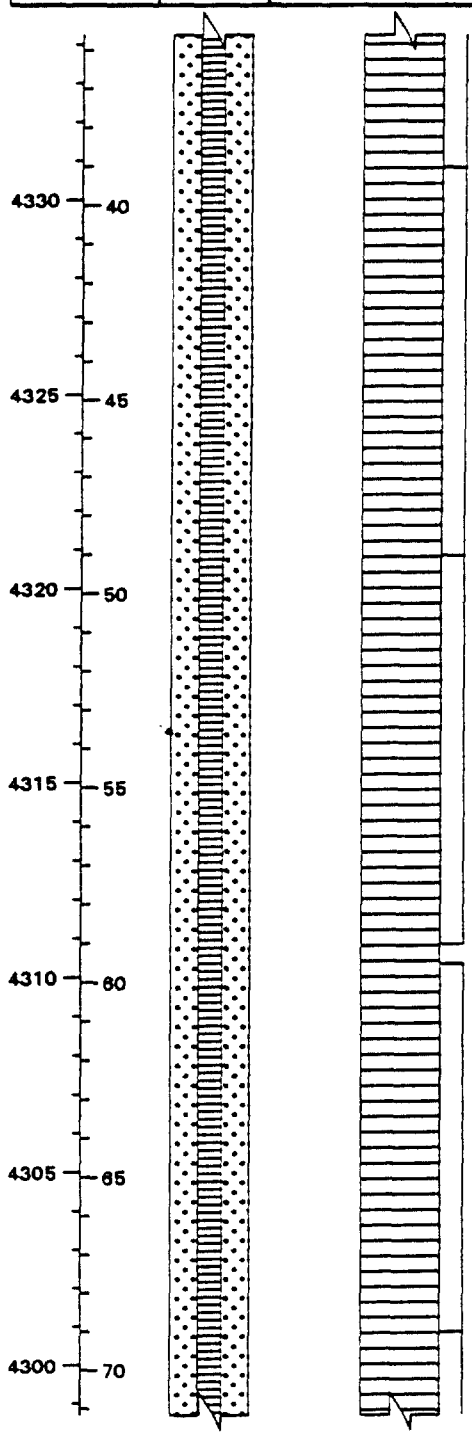
Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
[CL] SILTY CLAY: Brown, roots, sandy, stiff, dry.	S-1	0-2	24/24	
SHALE: Grayish tan, gypsum in fractures, very to moderately weathered, moderately hard, dry.	CA-2	5-6	8/12	
	B-3	10-11.5	14/18	
	B-4	15-16	8/12	
(Began coring at 19 feet.)				
...Shattered to close spaced fractures, fractures are non-intersecting and intersecting open planes, slightly weathered to fresh, dry.		19-29	120/120	0
				50
				67
				33
				58
				33
				83
				75
...Moderate spaced fractures from 27 to 29 feet.				100
...Very close to close spaced fractures from 29 to 36 feet.		29-39	120/120	0
				58
				100
				83

Hole diameter is 7.75 inches from 0 to 19 feet; and 4.25 inches from from 19 to 99 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-14

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 7-15-94
TOC ELEV.: 4372.77
GS ELEV.: 4369.86
LOGGED BY: DCH
HOLE NO.: MW-14



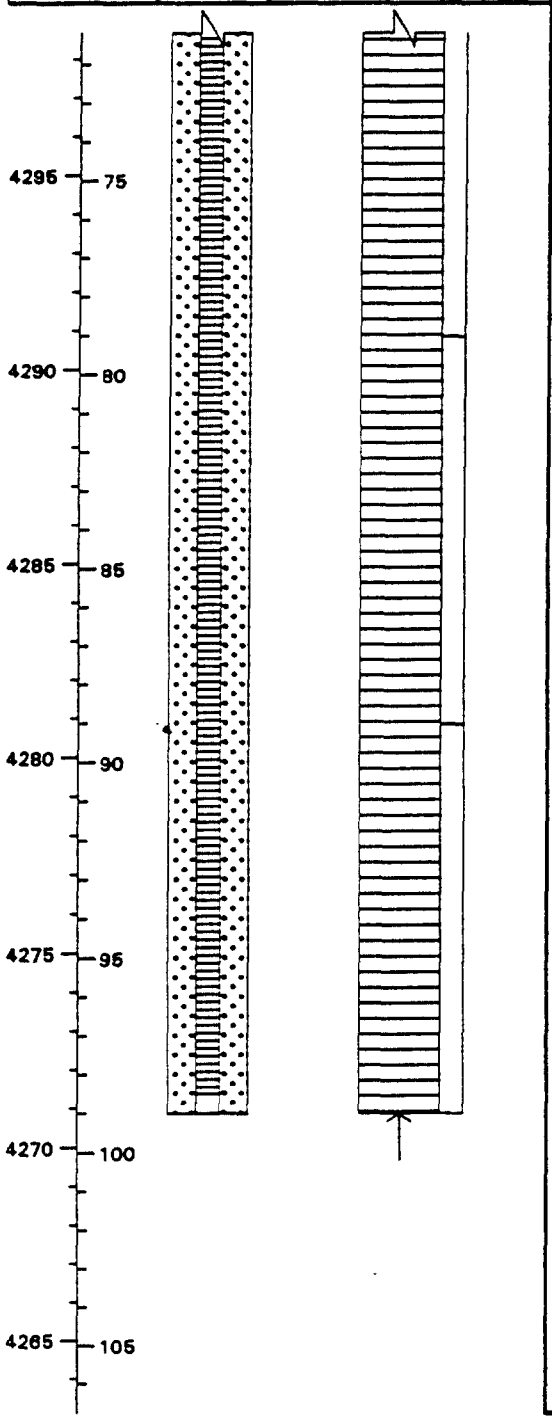
ELEVATION / DEPTH	WELL DETAILS	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
			...Close to moderate spaced fractures from 36 to 59 feet.				92 / 100
					39-49	120/120	
					49-59	120/120	75 / 100
							75 / 100
			...Wide spaced fractures from 59.5 to 99 feet.		59.5-69	114/114	
							67 / 100
					69-79	120/120	

Hole diameter is 7.75 inches from 0 to 19 feet; and 4.25 inches from from 19 to 99 feet.

DRILL HOLE LOG
DRILL HOLE NO.: MW-14

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-003
DATE: 7-15-94
TOC ELEV.: 4372.77
GS ELEV.: 4369.86
LOGGED BY: DCH
HOLE NO.: MW-14



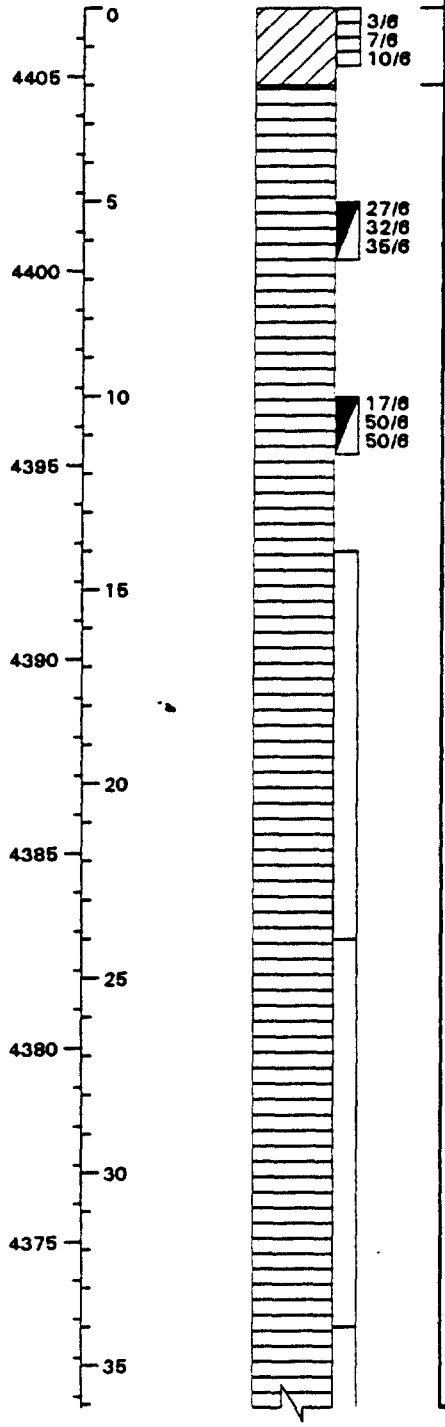
ELEVATION / DEPTH	WELL DETAILS	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
			...Grades moist to very moist.		79-89	120/120	75
					89-99	120/120	100

Hole diameter is 7.75 inches from 0 to 19 feet; and 4.25 inches from from 19 to 99 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-15

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

PROJECT NO.: 2106-002
DATE: 6-21-94
TOC ELEV.: NA
GS ELEV.: 4406.79
LOGGED BY: DEW
HOLE NO.: DH-15



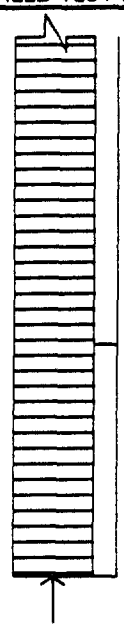
ELEVATION / DEPTH	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
		[CL] SILTY CLAY: Brown, roots, sandy, stiff to very stiff, dry.	CA-1	0-1.5	18/18	
		SHALE: Tan, gypsum in fractures, highly to moderately weathered, moderately hard to hard, dry.				
			B-1	5-6.5	16/18	
			B-2	10-11.5	11/18	
		(Began coring at 14 feet.) ...Gray, wide spaced fractures, fractures are non-intersecting open planes, weathered fresh, dry.		14-24	120/ 120	
		...Close to moderate spaced fractures from 24 to 44 feet.		24-34	120/ 120	
				34-44	120/ 120	

Hole diameter is 7.75 inches from 0 to 14 feet; and 4.25 inches from 14 to 50 feet.

DRILL HOLE LOG
DRILL HOLE NO.: DH-15

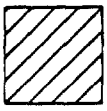
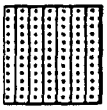
PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION:
DRILLER: Overland Drilling, Inc.
DRILL RIG: CME 75
DEPTH TO WATER: None

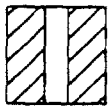
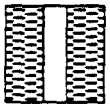
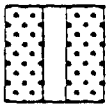
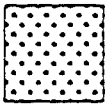
PROJECT NO.: 2106-002
DATE: 6-21-94
TOC ELEV.: NA
GS ELEV.: 4406.79
LOGGED BY: DEW
HOLE NO.: DH-15

ELEVATION / DEPTH	ROCK & SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	Description	Sample Number	Sample Depth (ft)	Sample Recovery (in/in)	RQD (%)
4370 / 40 / 4365 / 45 / 4360 / 50 / 4355 / 55 / 4350 / 60 / 4345 / 65 / 4340 / 70 / 4335		...Close spaced fractures from 44 to 50 feet		44-50	72/72	

Hole diameter is 7.75 inches from 0 to 14 feet; and 4.25 inches from 14 to 50 feet.

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Clayey sand
	Silt gravel
	Shale
	Silty Clay
	Silty sand
Misc. Symbols	
	Boring continues
	Drill hole completion depth
	Water table
Rock and Samplers	
	Standard penetration test (SPT)
	California sampler
	Rock core

Symbol	Description
	Undisturbed thin wall shelby tube
Monitor Well Details	
	Assorted cuttings blank 2" O.D. PVC pipe
	Silica sand 20 slot 2" O.D. PVC pipe.
	Protective well cover set in concrete
	Bentonite cell blank 2" O.D. PVC pipe
	Silica sand blank 2" O.D. PVC pipe
	Silica sand no PVC pipe

KEY TO SYMBOLS

Notes:

1. Drill holes DH-1,2,3,6,8,9,10,12 & 15, and monitor wells MW-2,4,5,7,7A, 13 and 14 were drilled and installed on June 20, 1994 through July 21, 1994. The holes were drill with the use of a CME 750 all-terrian drill rig utilizing 7.75 inch diameter (O.D.) hollow stem argers and an NX core drilling system.

2. Free water was encountered in drilling DH-2, DH-10, MW-2 and MW-5. Water levels were measured on July 22, 1994.

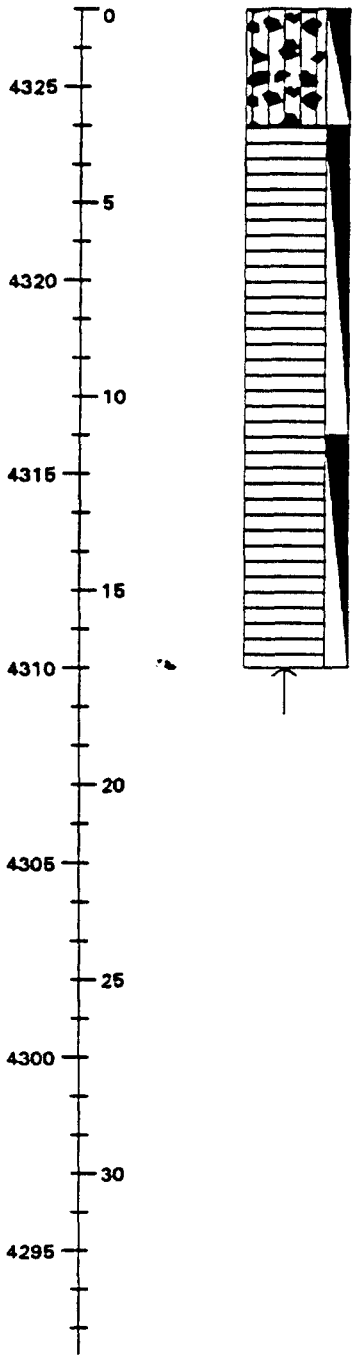
3. RQD percentage based on 12 inch length

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

TEST PIT LOG
TEST PIT NO.: TP-1

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4327.0
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/20/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-1

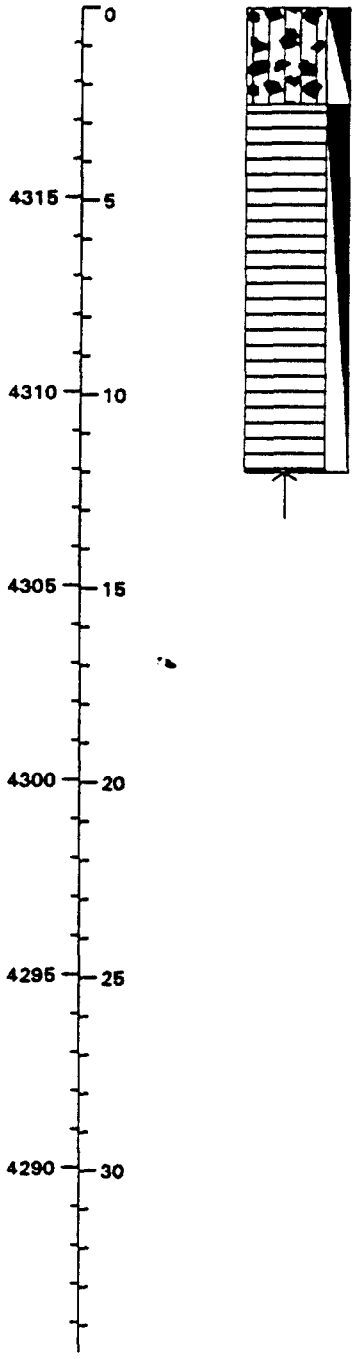


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		GM	SILTY GRAVEL: Tan, slightly clayey and sandy, dry.	B-1	0 - 3
		ROCK	SHALE, weathered, gray-black, dry	B-2	3 - 11
			grades more competent, black, dry to slightly moist	B-3	11 - 17

TEST PIT LOG
TEST PIT NO.: TP-2

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4319.9
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/20/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-2

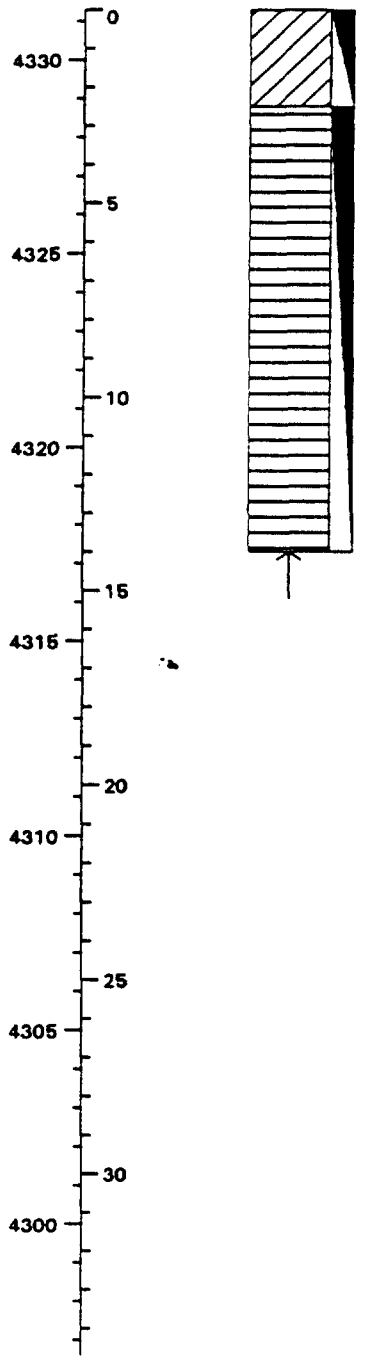


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		GM	SILTY GRAVEL: tan, some sand, dry	B-1	0 - 2.5
		ROCK	SHALE, weathered, gray-black, dry	B-2	2.5 - 12
			grades more competent, black, dry to slightly moist		

TEST PIT LOG
TEST PIT NO.: TP-3

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4331.3
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/20/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-3

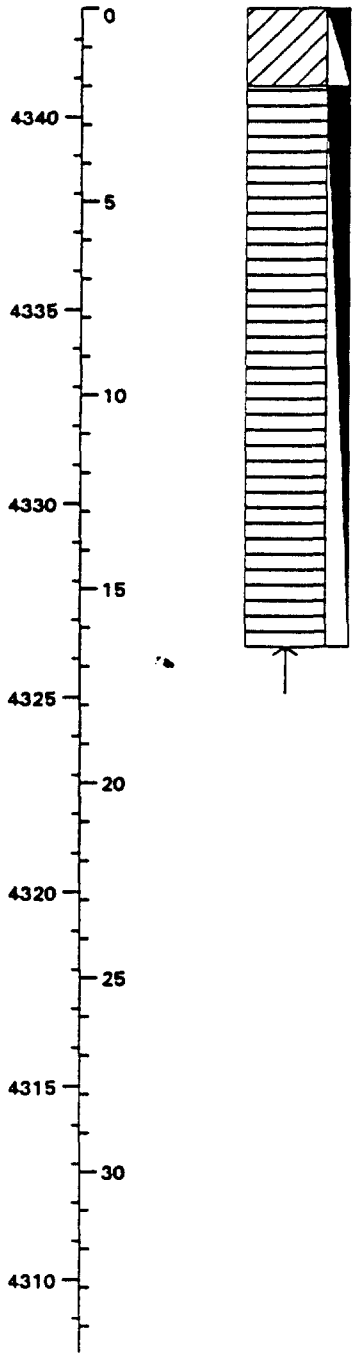


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, dry	B-1	0 - 2.5
		ROCK	SHALE, weathered, gray-black, dry	B-2	2.5 - 14
			vertical joint oriented approx. north-south noted from 5' to 10'		
			grades more competent, black, dry to slightly moist		

TEST PIT LOG
TEST PIT NO.: TP-4

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4342.8
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/20/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-4

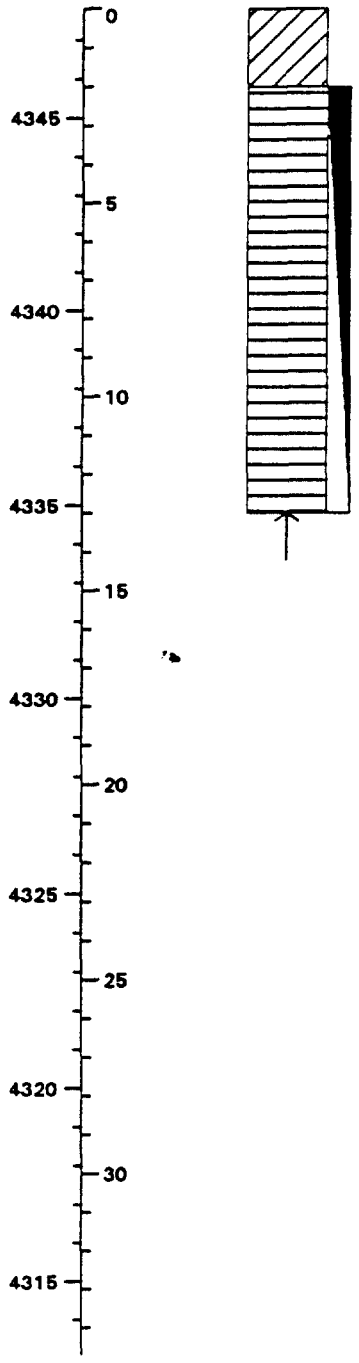


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, root material, dry	B-1	0 - 2
		ROCK	SHALE, weathered, gray-black, dry	B-2	2 - 16.5
			grades more competent, black, dry to slightly moist		

TEST PIT LOG
TEST PIT NO.: TP-5

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4347.8
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/20/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-5

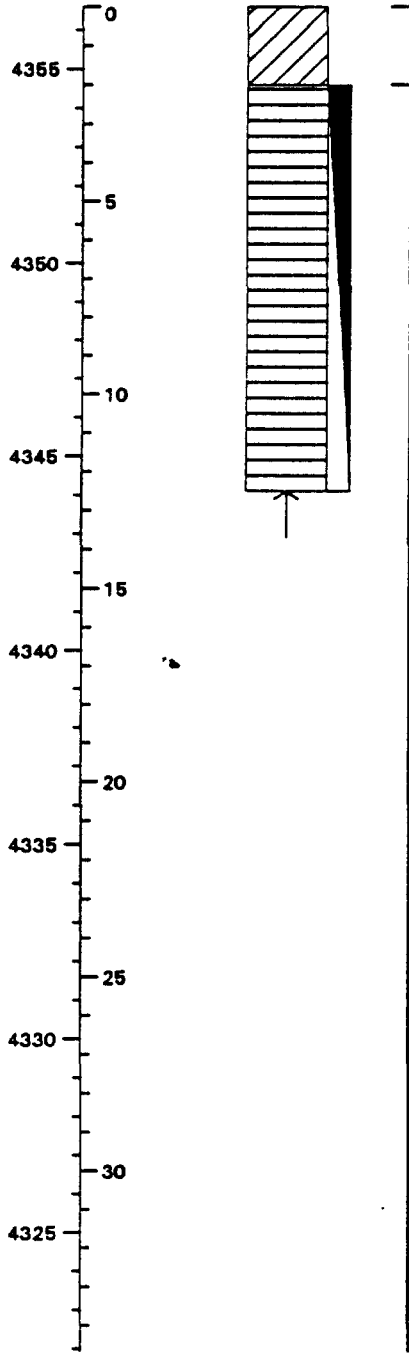


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, root material, dry		
		ROCK	SHALE, weathered, gray-black, dry	B-1	2 - 13
			grades more competant, black, dry to sightly moist		

TEST PIT LOG
TEST PIT NO.: TP-6

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4356.6
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-6

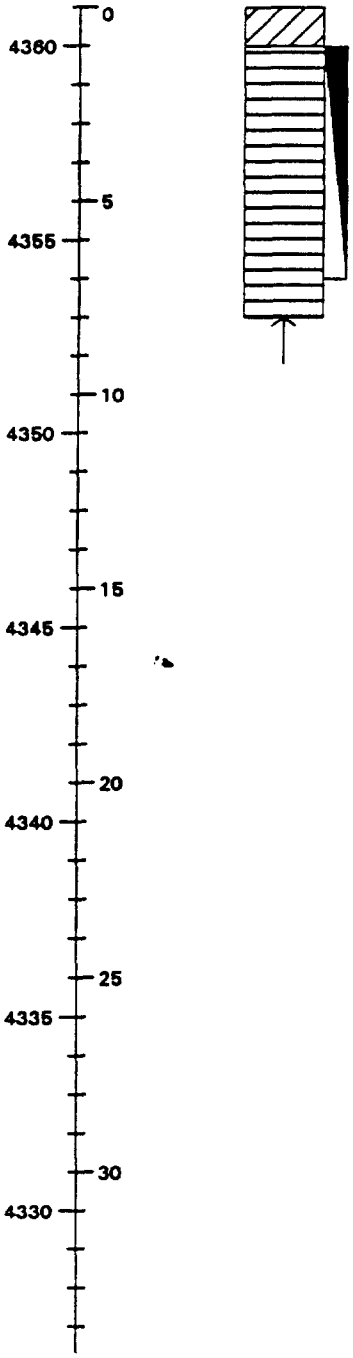


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, root material, dry		
		ROCK	SHALE, weathered, gray-black, dry hard layer 6" thick	B-1	2 - 12.5
			grades more competant, black, dry to sightly moist		

TEST PIT LOG
TEST PIT NO.: TP-7

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4361.0
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-7

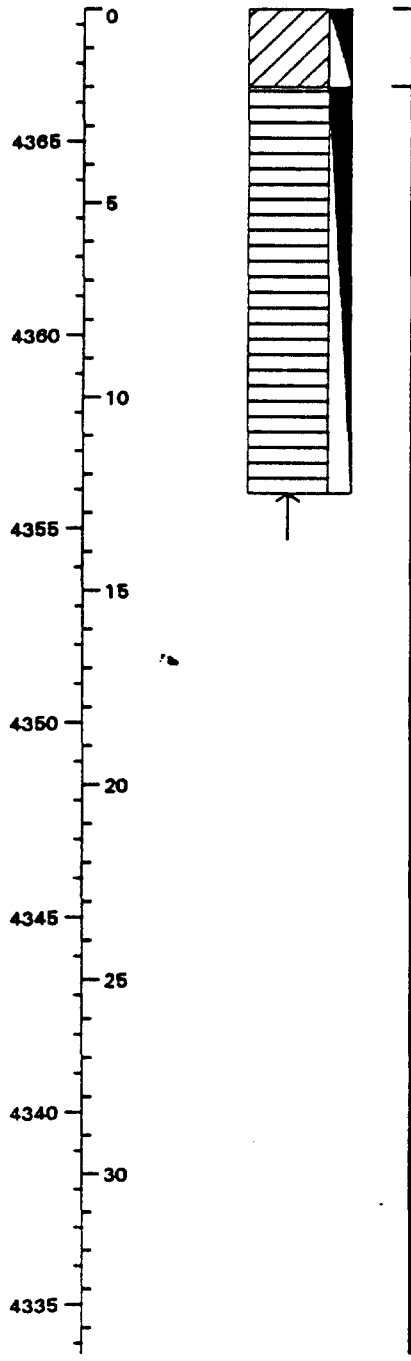


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, dry	B-1	2 - 8
		ROCK	SHALE, weathered, gray-black, dry		
			grades more competant, black, dry to sightly moist		

TEST PIT LOG
TEST PIT NO.: TP-8

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4368.4
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-8

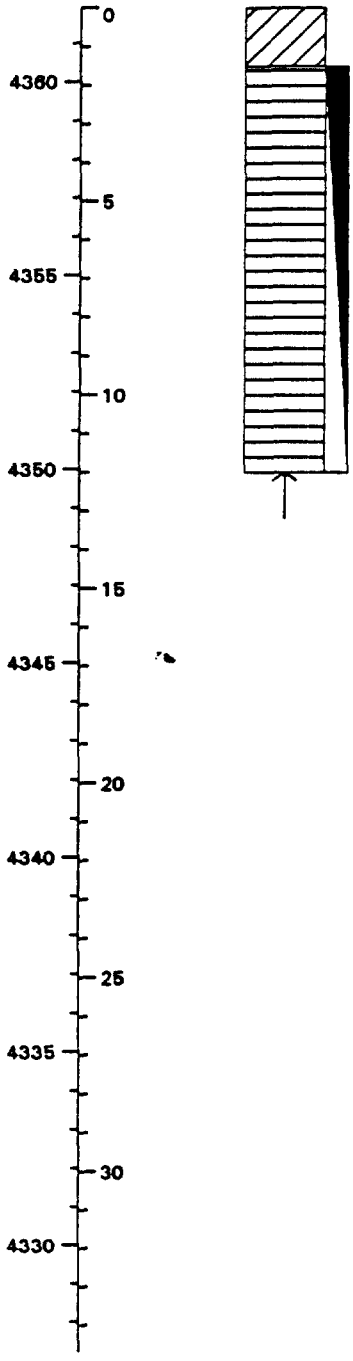


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, dead organic matter, shale flakes, some sand, dry	B-1	0 - 2
		ROCK	SHALE, gray-black, dry to slightly moist	B-2	2 - 12.5
			vertical joint oriented approx. north-south from 2' depth to bottom of pit		

TEST PIT LOG
TEST PIT NO.: TP-9

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4361.9
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-9

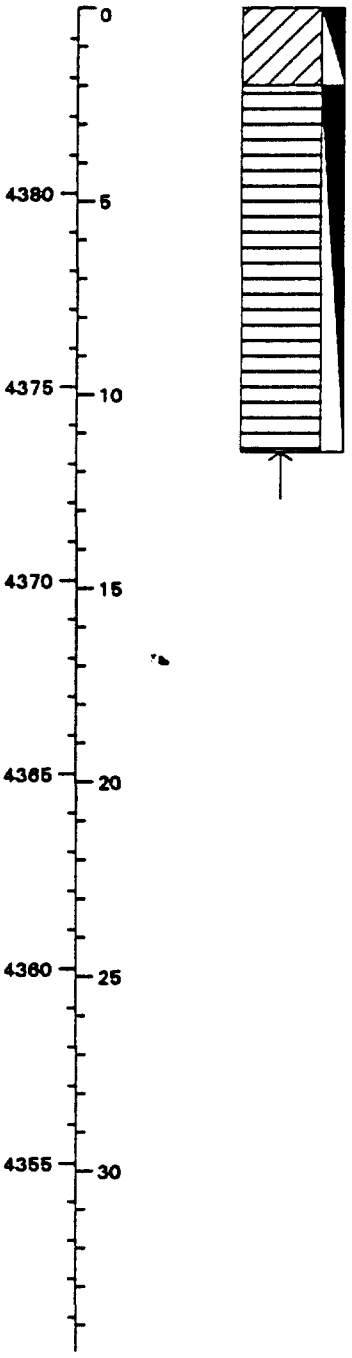


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, root material, dry		
		ROCK	SHALE, gray-black, dry to slightly moist	B-1	1.5 - 12

TEST PIT LOG
TEST PIT NO.: TP-10

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4384.8
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-10

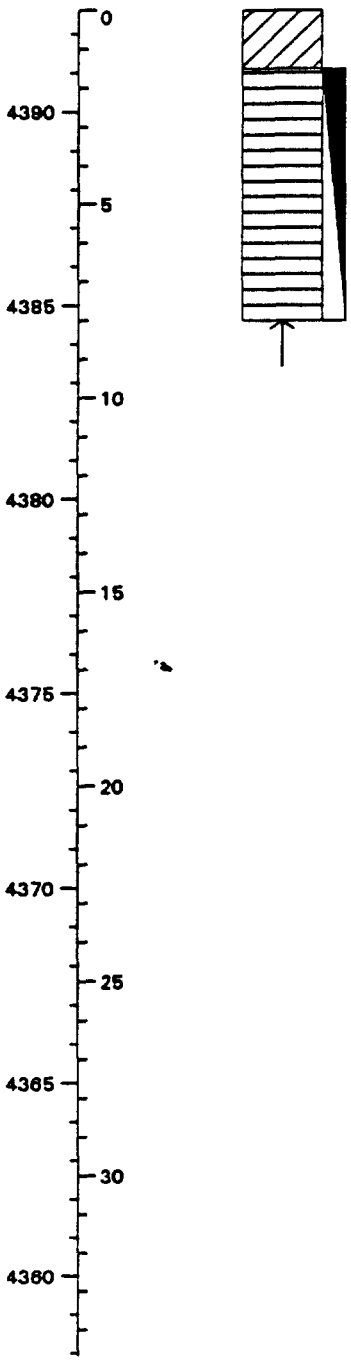


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, some sand, thin layer of gravel on surface, dry	B-1	0 - 2
		ROCK	SHALE, gray-black, dry to slightly moist, breaks into small fragments	B-2	2 - 11.5

TEST PIT LOG
TEST PIT NO.: TP-11

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4392.6
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-11

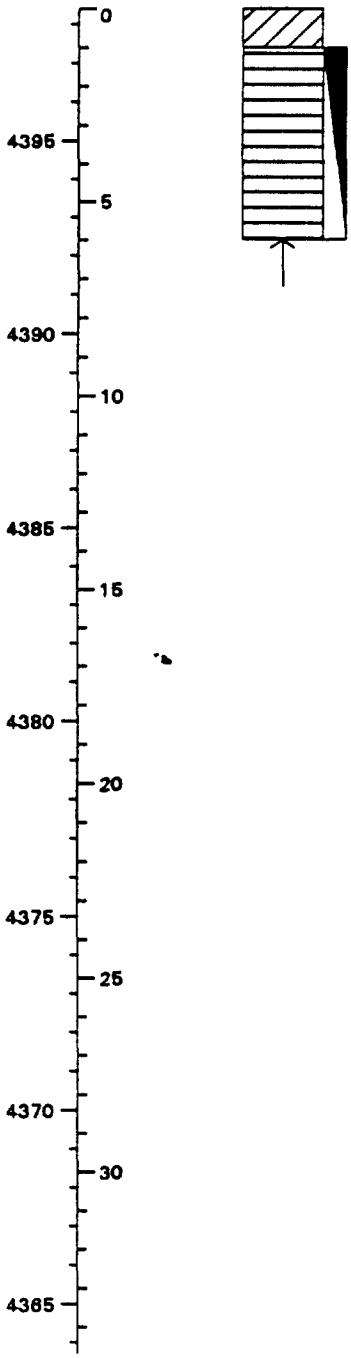


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, some sand, root material, dry	B-1	1.5 - 8
		ROCK	SHALE, gray-black, dry to slightly moist, blocky, breaks into blocks 5" to 8" across		

TEST PIT LOG
TEST PIT NO.: TP-12

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4398.4
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-12

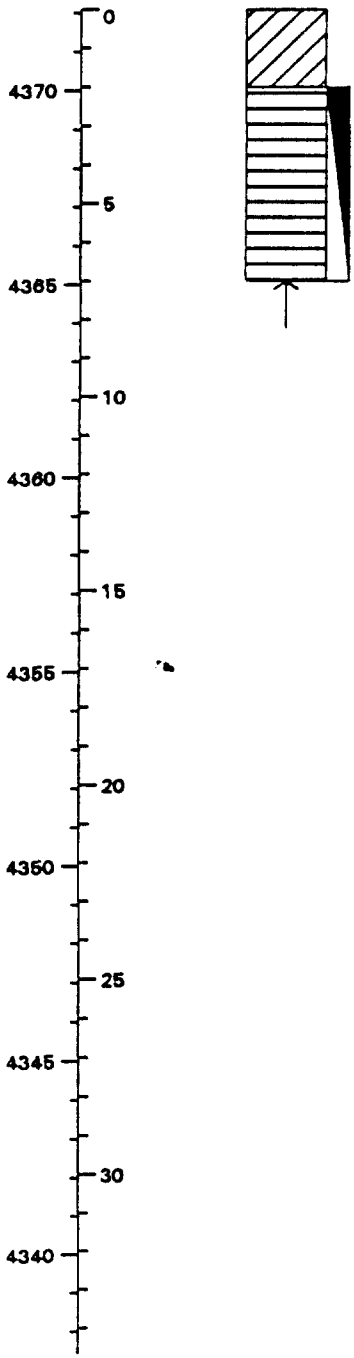


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: tan, dry	B-1	1 - 6
		ROCK	SHALE, gray-black, dry to slightly moist, blocky, blocks 8" to 14" blocks, concave and convex partition surfaces		

TEST PIT LOG
TEST PIT NO.: TP-13

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4372.1
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-13

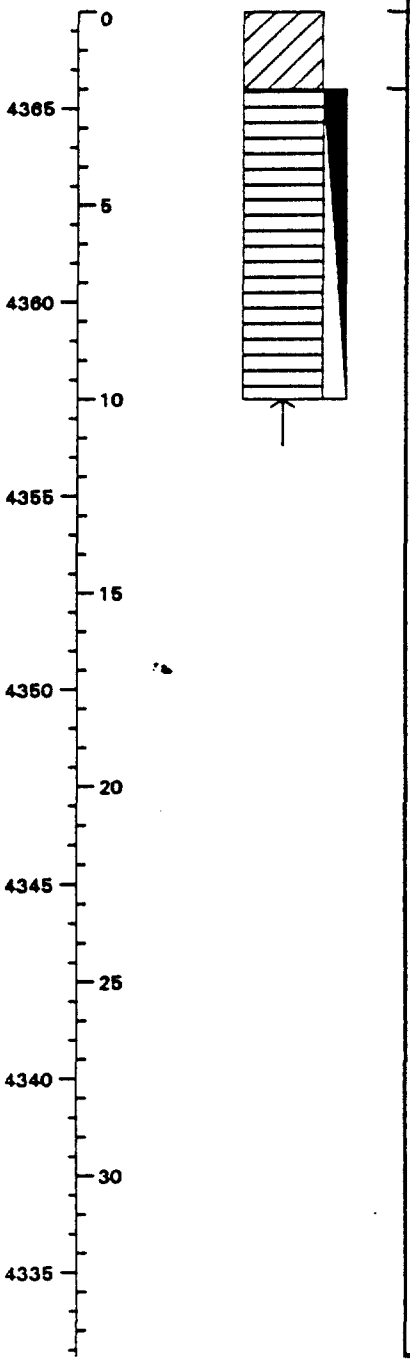


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: gray-brown, root matter, dry		
		ROCK	SHALE, gray-black, dry to slightly moist, blocky	B-1	2 - 7

TEST PIT LOG
TEST PIT NO.: TP-14

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4367.5
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-14

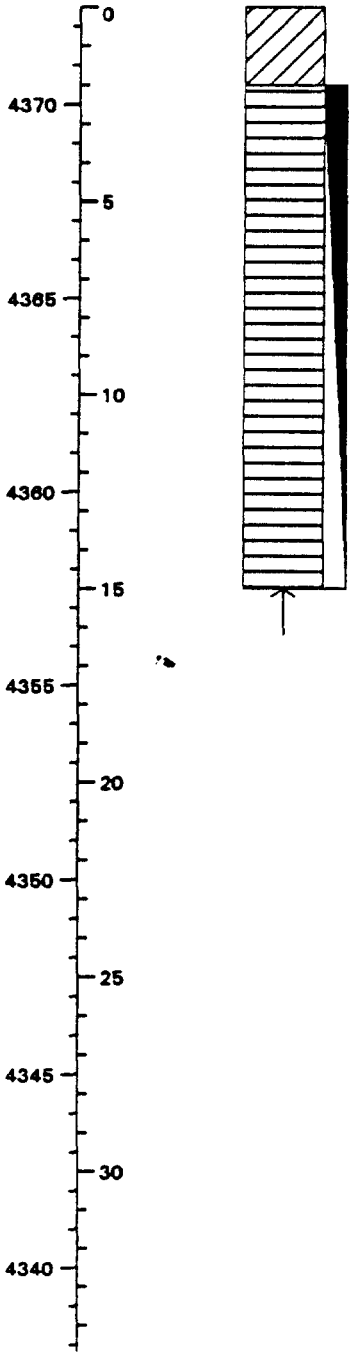


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: gray-brown, dry		
		ROCK	SHALE, gray-black, dry to slightly moist, breaks into small blocks	B-1	2 - 10

TEST PIT LOG
TEST PIT NO.: TP-15

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4372.5
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-15

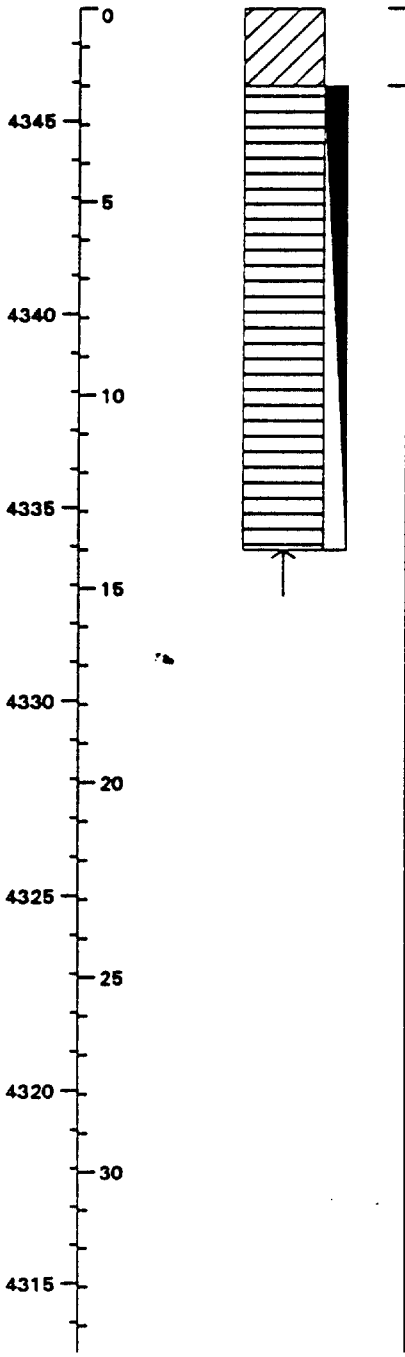


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: gray-brown, dry		
			orange layer of weathered shale 4" thick	B-1	2 - 15
		ROCK	SHALE, gray-black, dry to slightly moist, breaks into 1" to 4" blocks		
			grades more competant with 6" to 12" blocks		

TEST PIT LOG
TEST PIT NO.: TP-16

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4347.9
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-16

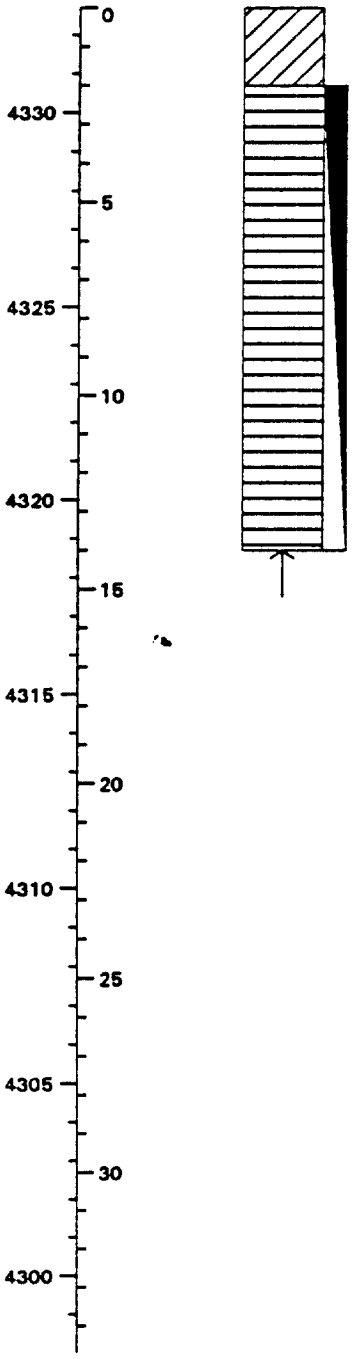


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: gray-brown, shale fragments, dry		
		ROCK	SHALE, gray-black, dry to slightly moist	B-1	2 - 14
			large joint visible on northeast wall of trench oriented approx. north-south, extends from 2' to bottom of pit		

TEST PIT LOG
TEST PIT NO.: TP-17

PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4332.7
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-17

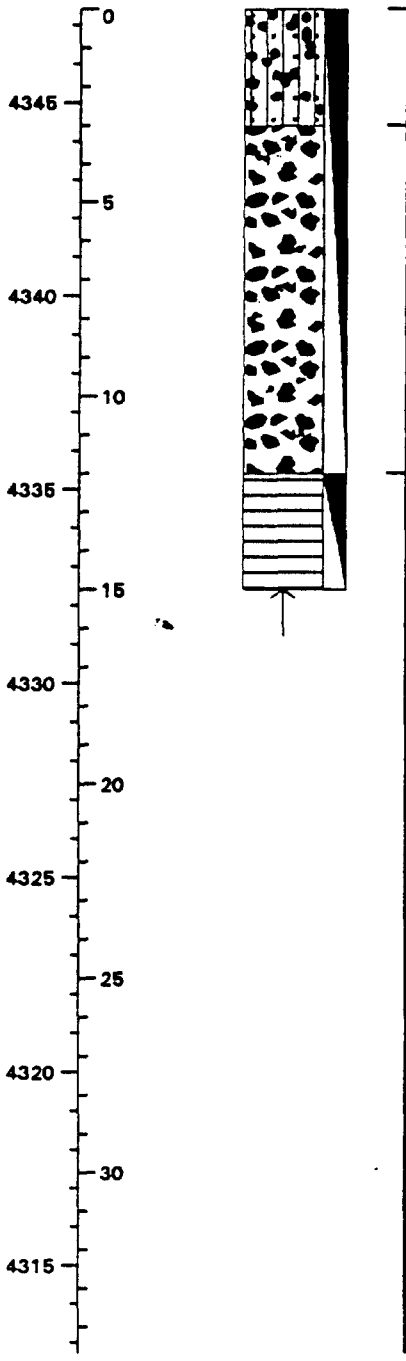


ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		CL	SILTY CLAY: gray-brown, shale fragments, dry		
		ROCK	SHALE, gray-black, dry to slightly moist, blocky, blocks 1" to 6" across	B-1	2 - 14

TEST PIT LOG
TEST PIT NO.: TP-18

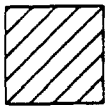
PROJECT: Green River Landfill
CLIENT/OWNER: Green River Landfill L.L.C.
LOCATION: N/A
EQUIPMENT: TRACKHOE
GS ELEV.: 4347.4
DEPTH TO WATER: N/A

PROJECT NO.: 2106-002
DATE: 6/21/94
LOGGED BY: KBC
PIT WIDTH: 3 ft
PIT LENGTH: 10 ft
TEST PIT NO.: TP-18



ELEVATION / DEPTH	SOIL SYMBOLS, SAMPLER SYMBOLS, AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)
		VG	Silty SAND with gravel 1/4" to 1/2" diameter, tan, dry	B-1	0 - 12
		GW	Well graded GRAVEL 1" to 2" diameter, tan, dry gravel grades to cobbles 6" in diameter		
		ROCK	SHALE, orange-gray, dry, weathered, fiable	B-2	12 - 15

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Silty gravel
	Shale
	Silty clay
	Variable gravel and silty sand mix
	Well graded gravel
Misc. Symbols	
↑	Drill hole completion depth
Soil Samplers	
	Bulk/Grab sample

Notes:

1. Test pits were excavated on June 20 and 21, 1994 using a track-mounted backhoe.
2. No free water was encountered at the time of excavation.
3. These logs are subject to the limitations, conclusions, and recommendations in this report.

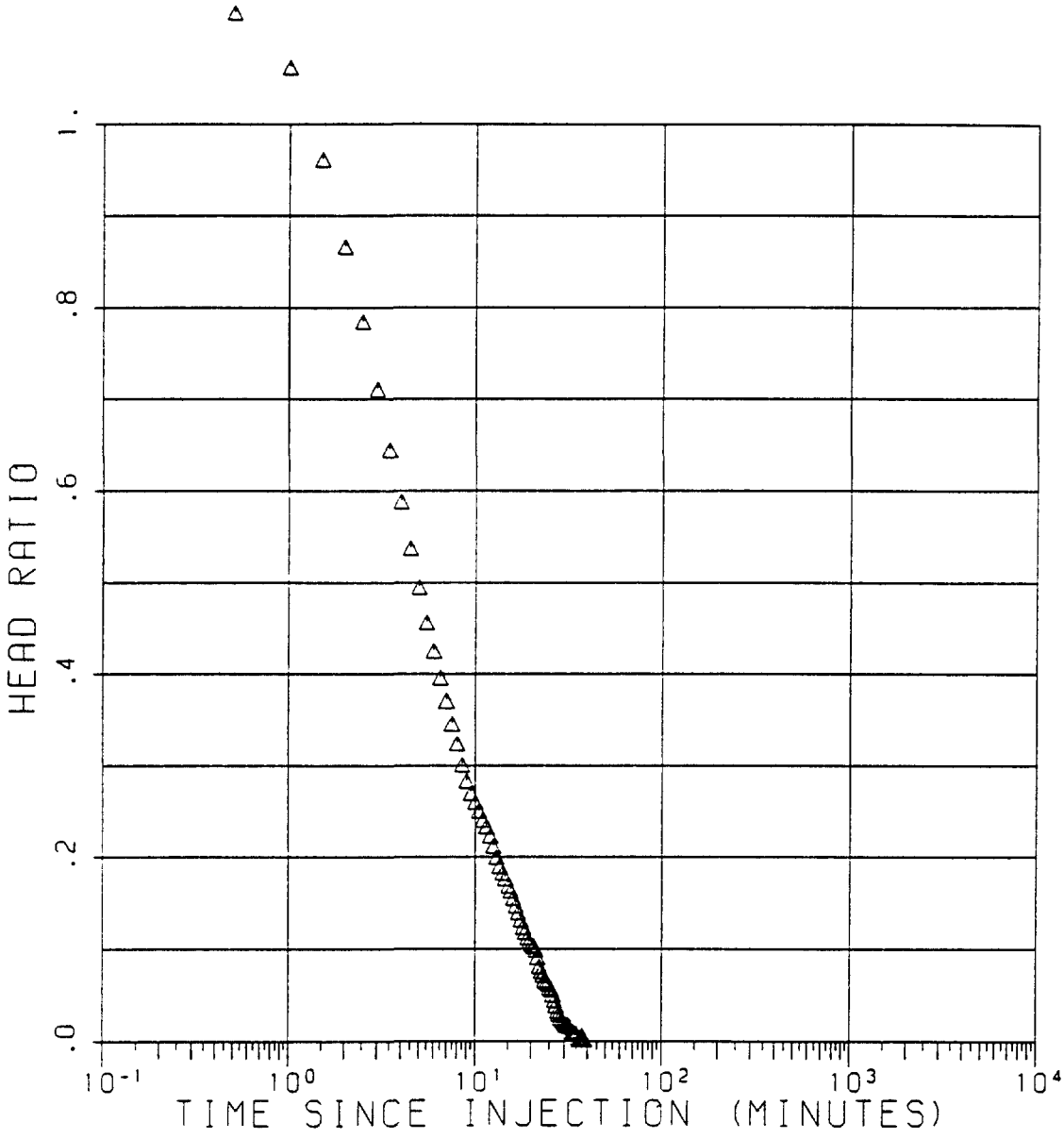
WELL # MW-5

WELL DIAMETER= 4.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .84 GALLONS
LENGTH OF AQUIFER TESTED= 60.00 FEET
VALUE OF H0= 5.15 FEET
STATIC WATER LEVEL= 5.39 FEET

SLUG TEST DATA:

TIME SINCE TEST BEGAN (MINUTES)	WATER LEVEL (FEET)	DRAWDOWN (FEET)	HEAD RATIO	RECIPROCAL TIME (1/MINUTES)
.50	11.17	5.78	1.123	2.000
1.00	10.86	5.47	1.063	1.000
1.50	10.34	4.95	.962	.667
2.00	9.85	4.46	.866	.500
2.50	9.43	4.04	.785	.400
3.00	9.05	3.66	.711	.333
3.50	8.71	3.32	.645	.286
4.00	8.42	3.03	.589	.250
4.50	8.16	2.77	.538	.222
5.00	7.94	2.55	.495	.200
5.50	7.74	2.35	.457	.182
6.00	7.58	2.19	.425	.167
6.50	7.43	2.04	.396	.154
7.00	7.30	1.91	.371	.143
7.50	7.17	1.78	.346	.133
8.00	7.06	1.67	.324	.125
8.50	6.94	1.55	.301	.118
9.00	6.85	1.46	.284	.111
9.50	6.78	1.39	.270	.105
10.00	6.73	1.34	.260	.100
10.50	6.68	1.29	.251	.095
11.00	6.63	1.24	.241	.091
11.50	6.59	1.20	.233	.087
12.00	6.54	1.15	.223	.083
12.50	6.48	1.09	.212	.080
13.00	6.42	1.03	.200	.077
13.50	6.37	.98	.190	.074
14.00	6.33	.94	.183	.071
14.50	6.30	.91	.177	.069
15.00	6.26	.87	.169	.067
15.50	6.23	.84	.163	.065
16.00	6.19	.80	.155	.063
16.50	6.15	.76	.148	.061
17.00	6.11	.72	.140	.059
17.50	6.07	.68	.132	.057
18.00	6.03	.64	.124	.056
18.50	6.00	.61	.119	.054
19.00	5.97	.58	.113	.053
19.50	5.95	.56	.109	.051
20.00	5.93	.54	.105	.050
20.50	5.92	.53	.103	.049
21.00	5.90	.51	.099	.048

21.50	5.86	.47	.091	.047
22.00	5.81	.42	.082	.045
22.50	5.78	.39	.076	.044
23.00	5.76	.37	.072	.043
23.50	5.73	.34	.066	.043
24.00	5.72	.33	.064	.042
24.50	5.71	.32	.062	.041
25.00	5.69	.30	.058	.040
25.50	5.68	.29	.056	.039
26.00	5.65	.26	.051	.038
26.50	5.62	.23	.045	.038
27.00	5.59	.20	.039	.037
27.50	5.56	.17	.033	.036
28.00	5.54	.15	.029	.036
28.50	5.52	.13	.025	.035
29.00	5.51	.12	.023	.034
29.50	5.50	.11	.021	.034
30.00	5.49	.10	.019	.033
30.50	5.48	.09	.017	.033
31.00	5.48	.09	.017	.032
31.50	5.48	.09	.017	.032
32.00	5.47	.08	.016	.031
32.50	5.45	.06	.012	.031
33.00	5.44	.05	.010	.030
33.50	5.44	.05	.010	.030
34.00	5.43	.04	.008	.029
34.50	5.43	.04	.008	.029
35.00	5.43	.04	.008	.029
35.50	5.41	.02	.004	.028
36.00	5.40	.01	.002	.028
36.50	5.41	.02	.004	.027
37.00	5.41	.02	.004	.027
37.50	5.42	.03	.006	.027
38.00	5.41	.02	.004	.026
38.50	5.40	.01	.002	.026
39.00	5.39	.00	.000	.026



SLUG TEST OF WELL MW-5

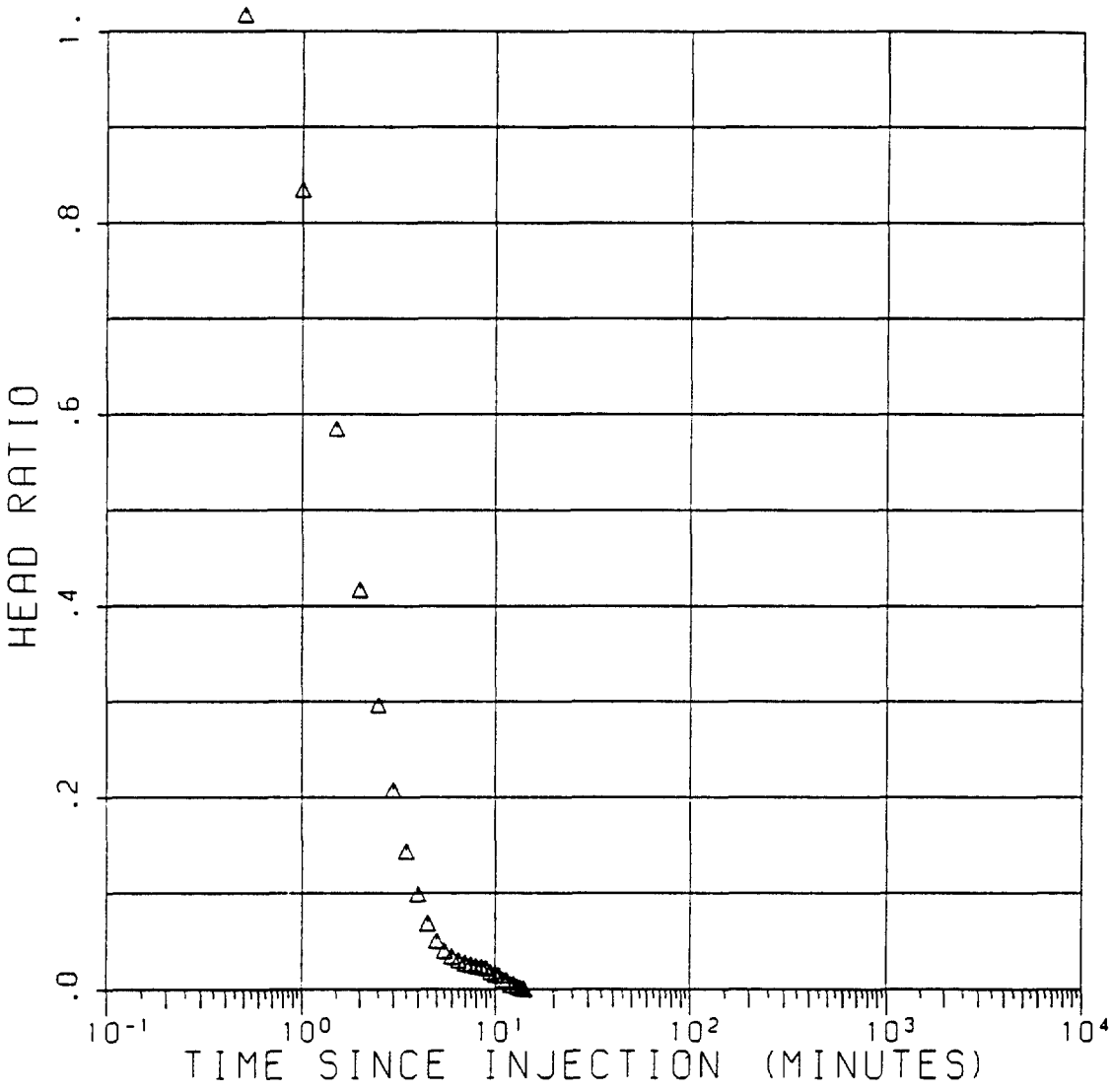
HEAD RATIO VS LOG TIME

WELL # MW-2

WELL DIAMETER= 4.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= 2.60 GALLONS
LENGTH OF AQUIFER TESTED= 75.00 FEET
VALUE OF H0= 15.93 FEET
STATIC WATER LEVEL= 2.75 FEET

SLUG TEST DATA:

TIME SINCE TEST BEGAN (MINUTES)	WATER LEVEL (FEET)	DRAWDOWN (FEET)	HEAD RATIO	RECIPROCAL TIME (1/MINUTES)
.50	18.97	16.22	1.018	2.000
1.00	16.05	13.30	.835	1.000
1.50	12.08	9.33	.586	.667
2.00	9.40	6.65	.417	.500
2.50	7.48	4.73	.297	.400
3.00	6.06	3.31	.208	.333
3.50	5.04	2.29	.144	.286
4.00	4.33	1.58	.099	.250
4.50	3.85	1.10	.069	.222
5.00	3.56	.81	.051	.200
5.50	3.39	.64	.040	.182
6.00	3.29	.54	.034	.167
6.50	3.23	.48	.030	.154
7.00	3.18	.43	.027	.143
7.50	3.15	.40	.025	.133
8.00	3.13	.38	.024	.125
8.50	3.12	.37	.023	.118
9.00	3.10	.35	.022	.111
9.50	3.04	.29	.018	.105
10.00	3.00	.25	.016	.100
10.50	2.98	.23	.014	.095
11.00	2.91	.16	.010	.091
11.50	2.90	.15	.009	.087
12.00	2.83	.08	.005	.083
12.50	2.83	.08	.005	.080
13.00	2.79	.04	.003	.077
13.50	2.77	.02	.001	.074
14.00	2.76	.01	.001	.071
14.50	2.75	.00	.000	.069



SLUG TEST OF WELL MW-2

HEAD RATIO VS LOG TIME

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*******************************************************************************
**                                                                           **
**                                                                           **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                    **
**            HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                     **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY                        **
**               USAE WATERWAYS EXPERIMENT STATION                           **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                           **
**                                                                           **
*******************************************************************************
*******************************************************************************

PRECIPITATION DATA FILE:    C:\HELP3\PRECIP8C.D4
TEMPERATURE DATA FILE:      C:\HELP3\TEMP8C.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\RAD8C.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\EVAP8C.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\SOIL8C.D10
OUTPUT DATA FILE:           C:\HELP3\OUT C 8.OUT

TIME:  22:47     DATE:  8/ 5/2002

*******************************************************************************

   TITLE:  Solitude Landfill -- Green River, Utah -- Closed Case

*******************************************************************************

   NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
          COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

                        LAYER  1
                        --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                 MATERIAL TEXTURE NUMBER  1
      THICKNESS                =    6.00  INCHES
      POROSITY                 =    0.4170 VOL/VOL
```

FIELD CAPACITY = 0.0450 VOL/VOL
WILTING POINT = 0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0974 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999978000E-02 CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 10
THICKNESS = 24.00 INCHES
POROSITY = 0.3980 VOL/VOL
FIELD CAPACITY = 0.2440 VOL/VOL
WILTING POINT = 0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1836 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.119999997000E-03 CM/SEC

LAYER 3

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 29
THICKNESS = 18.00 INCHES
POROSITY = 0.4510 VOL/VOL
FIELD CAPACITY = 0.4190 VOL/VOL
WILTING POINT = 0.3320 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4510 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.680000028000E-06 CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18
THICKNESS = 720.00 INCHES
POROSITY = 0.6710 VOL/VOL
FIELD CAPACITY = 0.2920 VOL/VOL
WILTING POINT = 0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

LAYER 5

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 29
THICKNESS = 12.00 INCHES
POROSITY = 0.4510 VOL/VOL
FIELD CAPACITY = 0.4190 VOL/VOL
WILTING POINT = 0.3320 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4510 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.680000028000E-06 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 1 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 3.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER = 72.40
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 100.000 ACRES
EVAPORATIVE ZONE DEPTH = 30.0 INCHES
INITIAL WATER IN EVAPORATIVE ZONE = 4.991 INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE = 12.054 INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE = 3.372 INCHES
INITIAL SNOW WATER = 0.000 INCHES
INITIAL WATER IN LAYER MATERIALS = 228.761 INCHES
TOTAL INITIAL WATER = 228.761 INCHES
TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM GRAND JUNCTION COLORADO

STATION LATITUDE = 39.07 DEGREES
MAXIMUM LEAF AREA INDEX = 0.00
START OF GROWING SEASON (JULIAN DATE) = 116
END OF GROWING SEASON (JULIAN DATE) = 288
EVAPORATIVE ZONE DEPTH = 30.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.10 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 60.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 36.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 36.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 57.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GRAND JUNCTION COLORADO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.40	0.32	0.59	0.50	0.61	0.41
0.57	0.74	0.71	0.87	0.41	0.39

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GRAND JUNCTION COLORADO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.90	32.60	42.90	52.40	61.90	71.30
78.50	75.60	65.50	52.90	39.10	27.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GRAND JUNCTION COLORADO
AND STATION LATITUDE = 39.07 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.33	0.29	0.51	0.54	0.59	0.45

0.49 0.82 0.59 0.81 0.54 0.32

STD. DEVIATIONS 0.16 0.17 0.23 0.27 0.43 0.48
0.33 0.37 0.46 0.58 0.35 0.20

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.310 0.318 0.417 0.480 0.705 0.491
0.397 0.671 0.770 0.784 0.575 0.338

STD. DEVIATIONS 0.152 0.146 0.257 0.276 0.502 0.452
0.321 0.479 0.548 0.665 0.357 0.175

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0000 0.0008 0.0009 0.0009 0.0005 0.0005
0.0003 0.0010 0.0009 0.0010 0.0008 0.0003

STD. DEVIATIONS 0.0000 0.0028 0.0011 0.0016 0.0007 0.0011
0.0003 0.0021 0.0026 0.0020 0.0012 0.0007

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0008 0.0009 0.0009 0.0005 0.0005
0.0003 0.0010 0.0009 0.0010 0.0008 0.0003

STD. DEVIATIONS 0.0000 0.0028 0.0011 0.0016 0.0007 0.0011
0.0003 0.0021 0.0026 0.0020 0.0012 0.0007

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0001 0.0000 0.0001 0.0000 0.0000
0.0000 0.0001 0.0001 0.0000 0.0000 0.0000

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.26 (1.028)	2271109.5	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
EVAPOTRANSPIRATION	6.256 (1.0693)	2270784.75	99.986
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00812 (0.00713)	2947.603	0.12979
AVERAGE HEAD ON TOP OF LAYER 3	0.000 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00812 (0.00713)	2947.603	0.12979
AVERAGE HEAD ON TOP OF LAYER 5	0.000 (0.000)		
CHANGE IN WATER STORAGE	-0.007 (0.3214)	-2623.24	-0.116

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)	
PRECIPITATION	0.80	290400.000	
RUNOFF	0.000	0.0000	
PERCOLATION/LEAKAGE THROUGH LAYER 3		0.005388	1955.78467
AVERAGE HEAD ON TOP OF LAYER 3		0.004	
PERCOLATION/LEAKAGE THROUGH LAYER 5		0.005388	1955.78467
AVERAGE HEAD ON TOP OF LAYER 5		0.002	
SNOW WATER	0.47	170607.0310	
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.2077	
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1442	

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	0.2702	0.0450
2	4.5759	0.1907
3	8.1180	0.4510
4	210.2400	0.2920
5	5.4120	0.4510
SNOW WATER	0.000	

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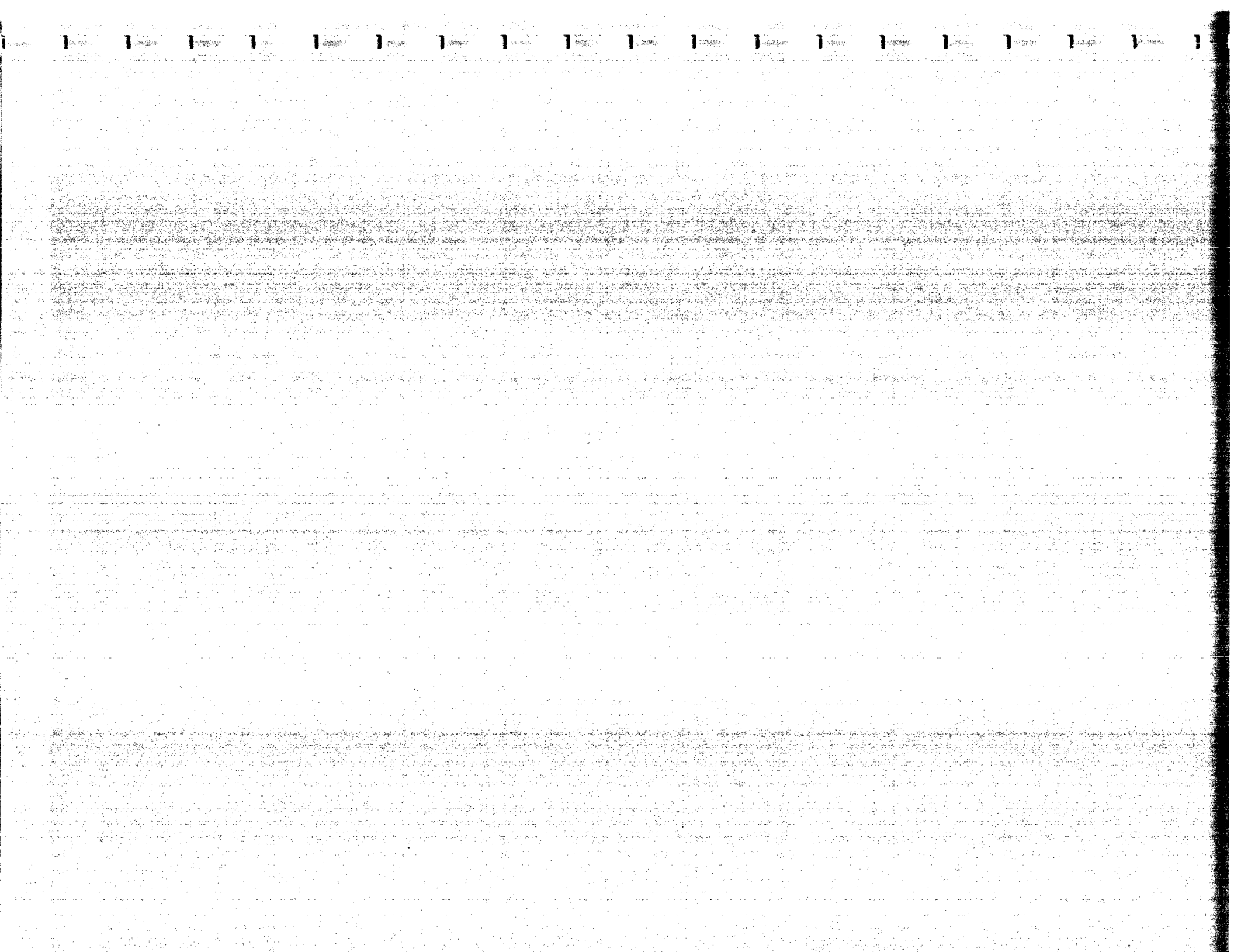

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**********************************************************************
**********************************************************************
**                                                                  **
**                                                                  **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE           **
**            HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)            **
**             DEVELOPED BY ENVIRONMENTAL LABORATORY                **
**               USAE WATERWAYS EXPERIMENT STATION                  **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY         **
**                                                                  **
**                                                                  **
**********************************************************************
**********************************************************************

PRECIPITATION DATA FILE:    C:\HELP3\PRECIP8O.D4
TEMPERATURE DATA FILE:      C:\HELP3\TEMP8O.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\RAD8O.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\EVAP8O.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\SOIL8O.D10
OUTPUT DATA FILE:           C:\HELP3\OUT O 8.OUT

TIME:  22:43     DATE:  8/ 5/2002

**********************************************************************

   TITLE:  Solitude Landfill -- Green River, Utah -- Open Case

**********************************************************************

   NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
          COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                      LAYER  1
                      --------

            TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  14
        THICKNESS             =     6.00   INCHES
        POROSITY              =     0.4790 VOL/VOL
```

FIELD CAPACITY = 0.3710 VOL/VOL
WILTING POINT = 0.2510 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.3505 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.249999994000E-04 CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18
THICKNESS = 120.00 INCHES
POROSITY = 0.6710 VOL/VOL
FIELD CAPACITY = 0.2920 VOL/VOL
WILTING POINT = 0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2735 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

LAYER 3

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 29
THICKNESS = 12.00 INCHES
POROSITY = 0.4510 VOL/VOL
FIELD CAPACITY = 0.4190 VOL/VOL
WILTING POINT = 0.3320 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4510 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.680000028000E-06 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #14 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 3.% AND A SLOPE LENGTH OF 100. FEET.

SCS RUNOFF CURVE NUMBER = 96.60
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 2.000 ACRES
EVAPORATIVE ZONE DEPTH = 30.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 6.888 INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE = 18.978 INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE = 3.354 INCHES
INITIAL SNOW WATER = 0.000 INCHES
INITIAL WATER IN LAYER MATERIALS = 40.332 INCHES
TOTAL INITIAL WATER = 40.332 INCHES
TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
GRAND JUNCTION COLORADO

STATION LATITUDE = 39.07 DEGREES
MAXIMUM LEAF AREA INDEX = 0.00
START OF GROWING SEASON (JULIAN DATE) = 116
END OF GROWING SEASON (JULIAN DATE) = 288
EVAPORATIVE ZONE DEPTH = 30.0 INCHES
AVERAGE ANNUAL WIND SPEED = 8.10 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 60.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 36.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 36.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 57.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GRAND JUNCTION COLORADO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.40	0.32	0.59	0.50	0.61	0.41
0.57	0.74	0.71	0.87	0.41	0.39

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GRAND JUNCTION COLORADO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.90	32.60	42.90	52.40	61.90	71.30
78.50	75.60	65.50	52.90	39.10	27.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GRAND JUNCTION COLORADO
AND STATION LATITUDE = 39.07 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.33	0.29	0.51	0.54	0.59	0.45
	0.49	0.82	0.59	0.81	0.54	0.32
STD. DEVIATIONS	0.16	0.17	0.23	0.27	0.43	0.48
	0.33	0.37	0.46	0.58	0.35	0.20
RUNOFF						
TOTALS	0.003	0.000	0.005	0.011	0.043	0.035
	0.035	0.051	0.038	0.072	0.010	0.001
STD. DEVIATIONS	0.008	0.001	0.009	0.018	0.054	0.075
	0.065	0.065	0.054	0.127	0.018	0.005
EVAPOTRANSPIRATION						
TOTALS	0.308	0.337	0.470	0.378	0.515	0.494
	0.414	0.653	0.628	0.793	0.651	0.342
STD. DEVIATIONS	0.151	0.143	0.260	0.144	0.416	0.444
	0.351	0.483	0.494	0.576	0.349	0.164
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0005	0.0011	0.0055	0.0017	0.0016	0.0055
	0.0059	0.0041	0.0011	0.0018	0.0016	0.0010
STD. DEVIATIONS	0.0023	0.0023	0.0157	0.0027	0.0026	0.0184
	0.0201	0.0121	0.0016	0.0029	0.0022	0.0017

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	
	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	
STD. DEVIATIONS	0.0000	0.0000	0.0002	0.0000	0.0000	0.0002	
	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	6.26	(1.028)	45422.2	100.00
RUNOFF	0.304	(0.1677)	2209.71	4.865
EVAPOTRANSPIRATION	5.981	(1.1320)	43422.56	95.598
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.03130	(0.07444)	227.209	0.50022
AVERAGE HEAD ON TOP OF LAYER 3	0.000	(0.000)		
CHANGE IN WATER STORAGE	-0.060	(0.5446)	-437.30	-0.963

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)	
PRECIPITATION	0.80	5808.000	
RUNOFF	0.273	1983.5400	
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.012390		89.94880
AVERAGE HEAD ON TOP OF LAYER 3	0.004		
SNOW WATER	0.47	3412.1404	
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2447		
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1518		

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	1.6205	0.2701
2	32.0952	0.2675
3	5.4120	0.4510
SNOW WATER	0.000	

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Memorandum of Understanding

The City of Green River, Utah ('City") and Landfill Investors, LLC ("Landfill"), a Nevada limited liability company, as authorized Agent-in-Fact for Green River Landfill, LLC ("Owner") a Utah limited liability company, collectively the Parties, hereby enter into this Memorandum of Understanding ("Memorandum") as of February 12, 2002. The Parties agree that this Memorandum contemplates that definitive documentation ("Agreement") will incorporate the provisions as set forth herein subject to detailed compliance to all regulatory statutes for the purposes stated with consideration of the welfare, safety and public health to the City of Green River.

WHEREAS the Owner desires to develop a certain tract of land as owned by Owner (exhibit "A") or acquired in addition to ("Land") for the purpose of providing one or more permitted Remote Municipal Non Hazardous and Non Industrial Solid Waste Facilities (RMNHNISWF") and has authorized and engaged Landfill to facilitate and manage this development; and

WHEREAS the City is desirous of receiving benefits in the form of Host Fees and future tax revenue derived from the development of the RMNHNISWF on the Land subject to meeting those regulatory and statute requirements as constituted to the date of permitting; and

WHEREAS the City recognizes that the Owner and Landfill will incur certain expenses related to the permitting process but prior to the execution of the Agreement.

THE PARTIES HEREBY agree to use their best efforts to finalize the Agreement on or before June 30, 2002, which may for the purposes necessary to timely affect the full force and effectiveness of the Agreement, require the inclusion of certain conditions precedent.

The Parties further agree to the following:

1) Landfill will be permitted to identify, negotiate and enter into applicable agreements with qualified solid waste management entities or waste generators that may develop, transport or place solid wastes in and upon the RMNHNISWF and Land, respectively. Nothing contained herein shall prohibit Landfill or an affiliate from self-permitting a RMNHNISWF in its own name. Landfill may represent that the City has consented to the intended development providing however that Landfill discloses and makes conditional any such agreement subject to the conditional requirements set forth in the Agreement.

All entities or parties (a "RMNHNISWF Entity") with whom Landfill contracts for the development, transportation or placement in and upon a permitted RMNHNISWF and Land, respectively will be obligated under that agreement to construct and operate (which shall include the transportation of solid waste) the RMNHNISWF as located on the Land, subject to the terms of a permit issued by the State of Utah, Division of Solid and Hazardous Waste, and subject to the Solid Waste Management Ordinance of the City of Green River as it may be reasonably amended from time to time in the discretion of the City

2) Landfill will be permitted to make any and all applications to the controlling regulatory agencies for determination of permitting requirements and the issuance of such permits necessary in the development of the Land for its intended purpose.
3) Upon terms and conditions mutually acceptable to the City and Landfill, Landfill shall cause the construction of infrastructure and improvements necessary to facilitate the development of multiple RMNHNISWF's with access from both rail and surface streets. Notwithstanding the foregoing the construction of any rail access shall be upon such schedule and sufficient contracted volume deemed necessary by Landfill to justify the capital expenditure and its reasonable amortization of costs.

The City will provide specific city services identified in a permit from the City for the facilities development on the Land as necessary to comply with the requirements of the Solid Waste Management Ordinance of the City of Green River. The City will not unreasonably deny approval of any RMNHNISWF Entity beyond the conditions outlined in a permit issued by the State of Utah and the Solid Waste Management Ordinance of the City of Green River as now constituted or amended.

4) Upon terms and conditions mutually acceptable to the City and Landfill, Landfill will pay or cause to be paid permit fees to the City, which will be identified in the Agreement and landfill permit from the City, such reasonable Host Fees as negotiated and agreed upon prior to permitting issuance allowing the constructions, development and operation of the RMNHNISWF. Landfill shall maintain or cause required records to be kept on each of the RMNHNISWF and shall cause monthly tonnage reports and other information that may be required to be submitted to the City. Payment of Host Fees will be made to the City quarterly in arrears along with submission of any other documents required to-be-provided as identified in the permit issued by the City.

5) This Memorandum cannot be assigned without the consent of the City.

The Parties further acknowledge that Landfill with the consent of Owner has engaged and retained Infill-Green River, Inc. a Utah Corporation ("Infill") to represent Landfill as its local representative in assisting in the development and permitting process. Authorized employees of Infill will be available to address and respond to written inquires pertaining issues, questions or concerns that may arise from the public venue or City representatives with the same force as if responded by Landfill. The Parties agree that Infill may coordinate with each RMNHNISWF Entity and may serve as Landfill's representative at Landfill's direction.

This Memorandum was presented to the Governing Body of the City of Green River and was accepted and approved on the 12th day of February 2002.

City of Green River

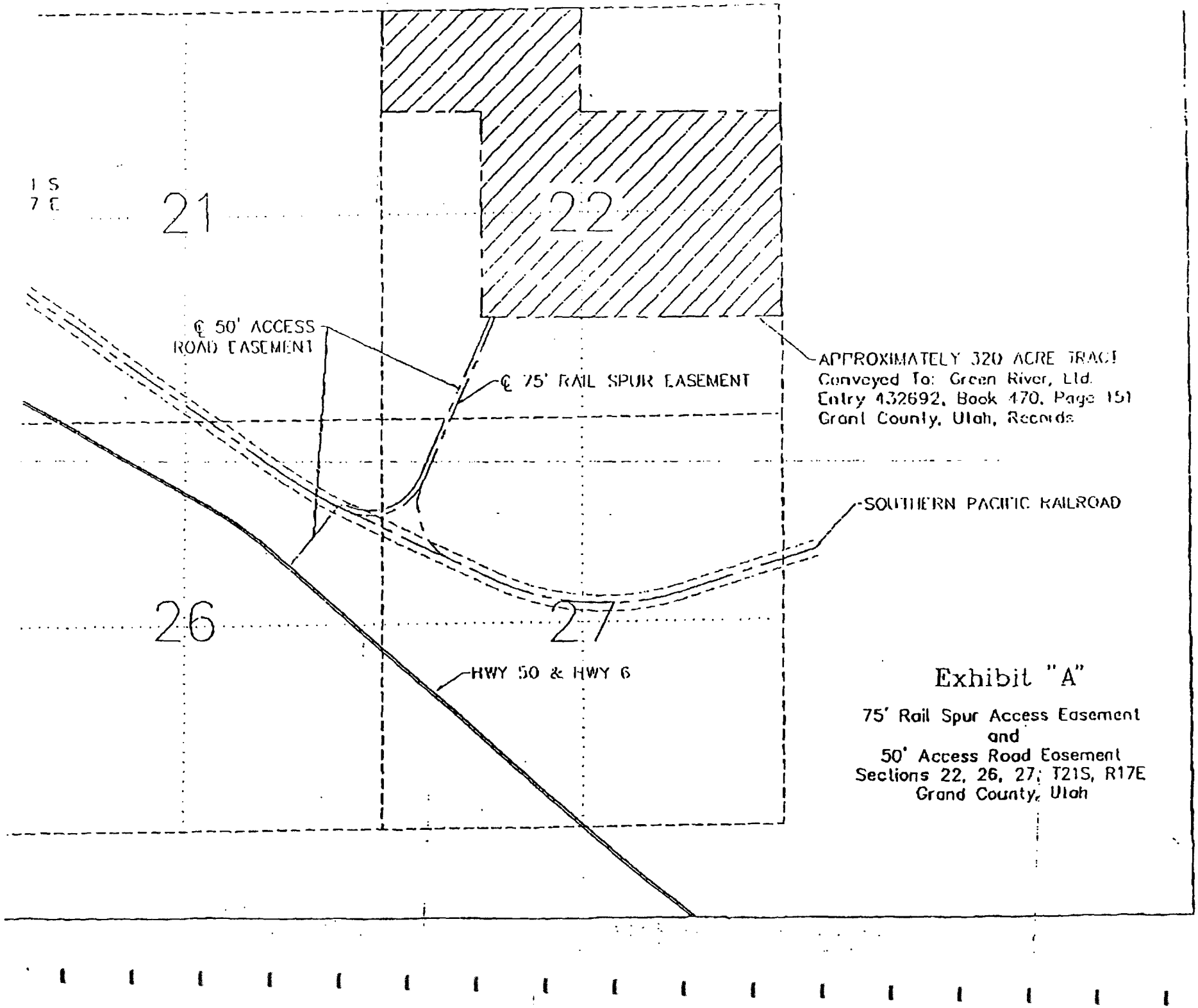
By: _____
Its: Mayor

Landfill Investors, LLC

By: _____
Its: PRESIDENT

Attested:

Conar Black
City Recorder



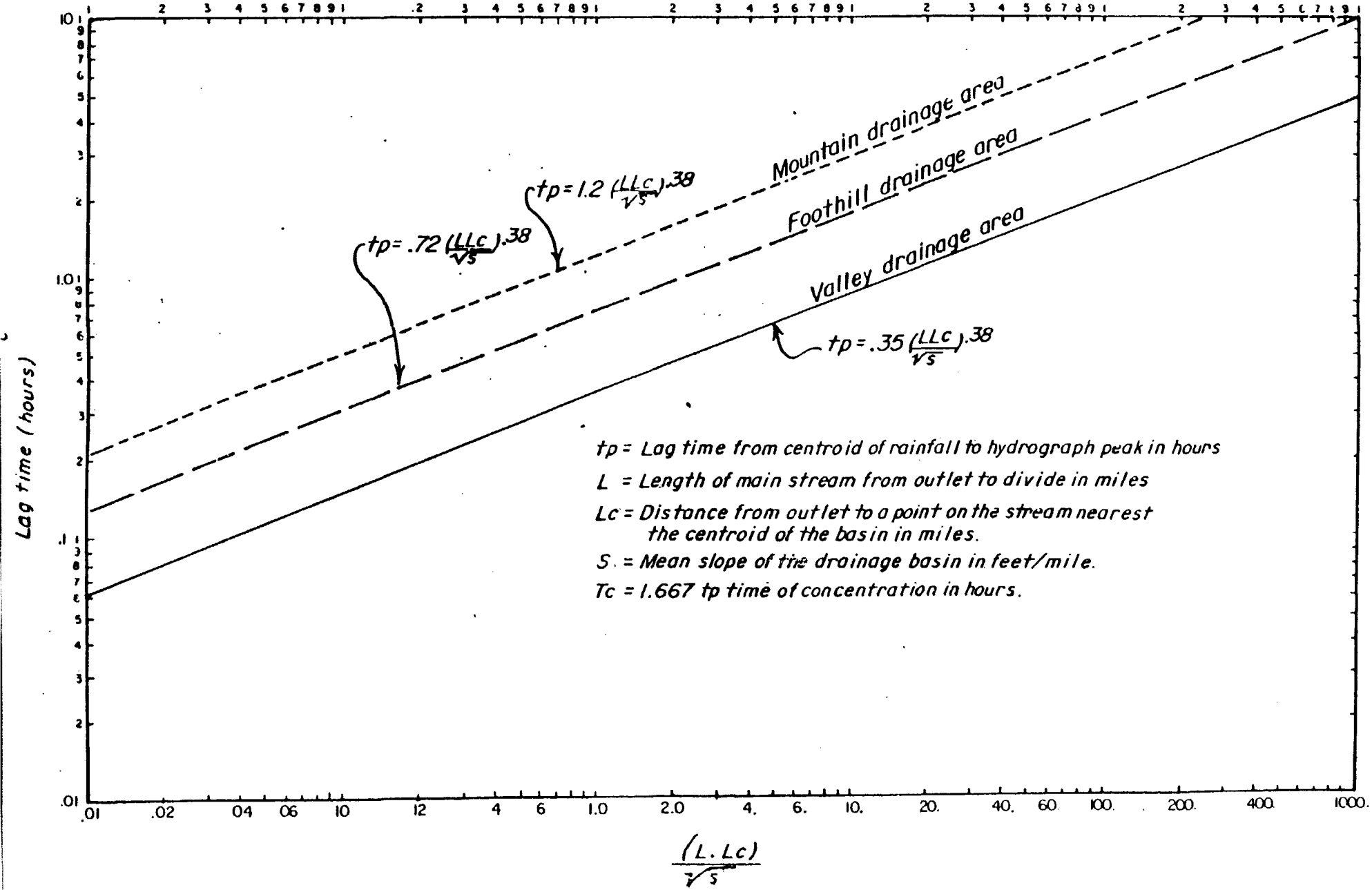
Purpose: Calculate max discharge of ~~mean~~ max outfall and use this flowrate to size the silt fence.

Assume: Flow from all contributing Areas peak at same time
Four outfalls
25-yr, 24-hr storm
Waste cell is disturbed (largest flow)

? "disturbed" @I belive, meaning cell has been stripped of vegetation

Determine Outfall Flows

1→	1/2 of Area A	8
	Area B	60
	Area C	205
	Waste cell (200 acres)	375
		648 cfs
2→	1/2 of Area A	8
	Waste cell (15 acres)	28
		36 cfs
3→	Waste cell (65 acres)	122 cfs
4→	[redacted] cell (40 acres)	130
		75
		205 cfs



Relationship between basin lag and basin characteristics (U.S. Corps of Engineers)

Purpose: Calculate runon from upgradient areas that surround the proposed site from the 25 yr - 24 hr and 100 yr - 24 hr storm.

Assume: Runon from areas shown on attached sheet
Use SCS method to calculate runoff
CN = 92 (Design of Small Dams, BOR 1977)
Areas are undisturbed with poor-condition herbaceous vegetation
Soil group is ~ → Not sure, almost certain it is D
25 yr, 24 hr storm = 2.0" (NOAA Atlas 2, 1978)
100 yr, 24 hr storm = 2.5"
Four areas that produce runon

? probably just delete

	Area (mi^2)
A	0.014
B	0.058
C	0.19
D	0.14

Determine Time of Concentration (t_c)

$$t_c = 1.667 (C) [(L)(L_c)(S)^{-1/2}]^{0.38}$$

C = constant based on drainage area
- 0.35 for valley drainage
- 0.72 for foothill drainage
- 1.2 for mountain drainage

L = Length of main stream (miles)
L_c = Distance from outlet to centroid of area (miles)
S = Mean slope (feet/mile)

A → L = 500'
L_c = 200'
S = 265 feet/mile
C = 0.72
t_c = 0.05 hr

B → L = 2000'
L_c = 700'
S = 90
C = 0.72
t_c = 0.16 hr

C → L = 1100'
L_c = 510'
S = 220
C = 0.72
t_c = 0.10 hr

D → L = 2800
L_c = 1200
S = 170
C = 0.72
t_c = 0.20 hr

ITEX, Site Runoff (Undisturbed, 0.25 sq. miles), 100-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 2.500 DURATION = 24.0 RUNOFF = 1.693

STORM DISTRIBUTION IS SCS 24-HR

CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)		NET RAIN (INCHES)	DISCHARGE (CFS)
22.500	.0030	.0028	4.52	
22.600	.0030	.0028	4.52	
22.700	.0030	.0028	4.52	
22.800	.0030	.0028	4.52	
22.900	.0030	.0028	4.52	
23.000	.0030	.0028	4.52	
23.100	.0030	.0028	4.52	
23.200	.0030	.0028	4.52	
23.300	.0030	.0028	4.52	
23.400	.0030	.0028	4.53	
23.500	.0030	.0028	4.53	
23.600	.0030	.0028	4.53	
23.700	.0030	.0028	4.53	
23.800	.0030	.0028	4.53	
23.900	.0030	.0028	4.53	
24.000	.0030	.0028	4.53	
24.100	.0000	.0000	4.53	
24.200	.0000	.0000	1.50	
24.300	.0000	.0000	.34	
24.400	.0000	.0000	.06	
24.500	.0000	.0000	.00	
TOTALS	2.500	1.6931	2761.68	

STORM HYDROGRAPH VOLUME = 22.82 ACRE-FEET

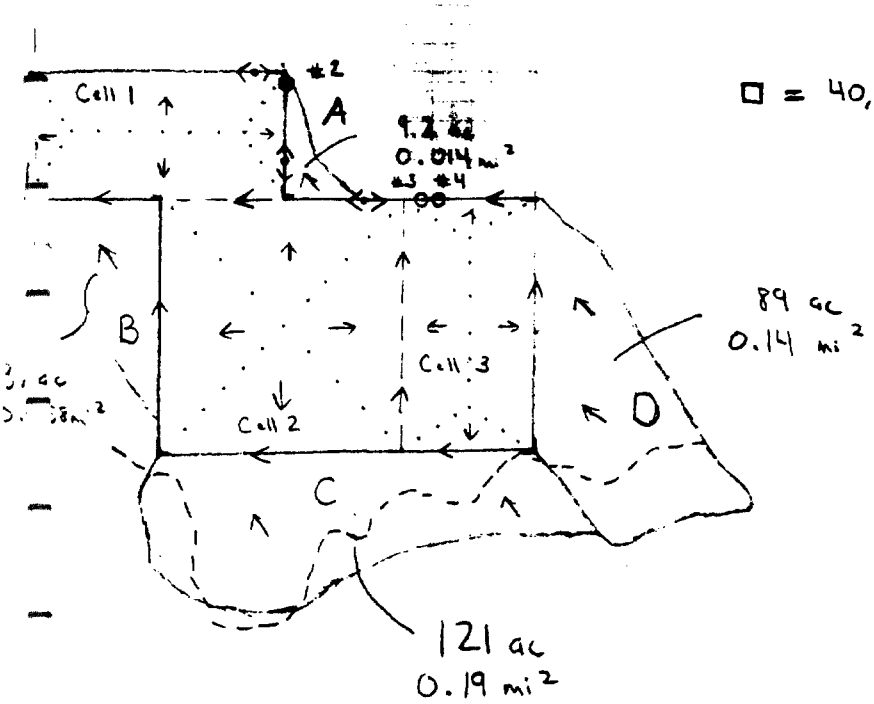
MAXIMUN STORM DISCHARGE = 362.05 CFS

Calculate Runoff

Flow (cfs)

Area	25-yr 24-hr	100-yr 24-hr	10-yr, 24-hr
A	15	20	12
B	60	80	42
C	205	275	150
D	130	175	110
	410		

ITEX , 2106-006 , DEK, 11/15/94



□ = 40,000 ft²

Calculate Drainage Areas

ITEX, Drainage "A" Runon, 25-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 2.000 DURATION = 24.0 RUNOFF = 1.237
STORM DISTRIBUTION IS SCS 24-HR
CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
.000	.0000	.0000	.00
.100	.0024	.0000	.00
.200	.0024	.0000	.00
.300	.0024	.0000	.00
.400	.0024	.0000	.00
.500	.0024	.0000	.00
.600	.0024	.0000	.00
.700	.0024	.0000	.00
.800	.0024	.0000	.00
.900	.0024	.0000	.00
1.000	.0024	.0000	.00
		NO RUNOFF	
6.500	.0040	.0000	.00
6.600	.0040	.0001	.00
6.700	.0040	.0001	.01
6.800	.0040	.0001	.01
6.900	.0040	.0002	.01
7.000	.0040	.0002	.02
7.100	.0040	.0002	.02
7.200	.0040	.0003	.02
7.300	.0040	.0003	.02
7.400	.0040	.0003	.03
7.500	.0040	.0004	.03
7.600	.0040	.0004	.03
7.700	.0040	.0004	.04
7.800	.0040	.0005	.04
7.900	.0040	.0005	.04
8.000	.0040	.0005	.04
8.100	.0054	.0008	.05
8.200	.0054	.0008	.06
8.300	.0054	.0009	.07
8.400	.0054	.0009	.08
8.500	.0054	.0010	.08
8.600	.0054	.0010	.08
8.700	.0054	.0011	.09
8.800	.0054	.0011	.09
8.900	.0054	.0012	.10
9.000	.0054	.0012	.10
9.100	.0064	.0015	.11
9.200	.0064	.0016	.13
9.300	.0064	.0016	.14
9.400	.0064	.0017	.14
9.500	.0064	.0017	.15
9.600	.0072	.0020	.15

9.700	.0072	.0021	.17
9.800	.0072	.0022	.18
9.900	.0072	.0022	.19
10.000	.0072	.0023	.19
10.100	.0092	.0030	.20
10.200	.0092	.0031	.26
10.300	.0092	.0032	.27
10.400	.0092	.0033	.28
10.500	.0092	.0034	.29
10.600	.0124	.0048	.30
10.700	.0124	.0050	.40
10.800	.0124	.0051	.43
10.900	.0124	.0053	.45
11.000	.0124	.0054	.46
11.100	.0192	.0087	.47
11.200	.0192	.0090	.72
11.300	.0192	.0093	.78
11.400	.0192	.0096	.81
11.500	.0192	.0099	.84
11.600	.0832	.0461	.87
11.700	.0832	.0504	3.61
11.800	.1520	.1011	4.33
11.900	.2208	.1621	8.26
12.000	.2208	.1749	13.43
12.100	.0288	.0235	15.12
12.200	.0288	.0237	3.85
12.300	.0288	.0238	2.24
12.400	.0288	.0240	2.09
12.500	.0288	.0241	2.10
12.600	.0148	.0124	2.11
12.700	.0148	.0125	1.23
12.800	.0148	.0125	1.10
12.900	.0148	.0125	1.09
13.000	.0148	.0126	1.10
13.100	.0108	.0092	1.10
13.200	.0108	.0092	.84
13.300	.0108	.0092	.81
13.400	.0108	.0092	.81
13.500	.0108	.0092	.81
13.600	.0084	.0072	.81
13.700	.0084	.0072	.66
13.800	.0084	.0072	.63
13.900	.0084	.0072	.63
14.000	.0084	.0072	.63
14.100	.0060	.0052	.63
14.200	.0060	.0052	.48
14.300	.0060	.0052	.46
14.400	.0060	.0052	.45
14.500	.0060	.0052	.45
14.600	.0060	.0052	.45
14.700	.0060	.0052	.46
14.800	.0060	.0052	.46
14.900	.0060	.0052	.46
15.000	.0060	.0052	.46
15.100	.0060	.0052	.46

15.200	.0060	.0052	.46
15.300	.0060	.0052	.46
15.400	.0060	.0052	.46
15.500	.0060	.0052	.46
15.600	.0060	.0052	.46
15.700	.0060	.0052	.46
15.800	.0060	.0052	.46
15.900	.0060	.0052	.46
16.000	.0060	.0052	.46
16.100	.0036	.0031	.46
16.200	.0036	.0032	.30
16.300	.0036	.0032	.28
16.400	.0036	.0032	.28
16.500	.0036	.0032	.28
16.600	.0036	.0032	.28
16.700	.0036	.0032	.28
16.800	.0036	.0032	.28
16.900	.0036	.0032	.28
17.000	.0036	.0032	.28
17.100	.0036	.0032	.28
17.200	.0036	.0032	.28
17.300	.0036	.0032	.28
17.400	.0036	.0032	.28
17.500	.0036	.0032	.28
17.600	.0036	.0032	.28
17.700	.0036	.0032	.28
17.800	.0036	.0032	.28
17.900	.0036	.0032	.28
18.000	.0036	.0032	.28
18.100	.0036	.0032	.28
18.200	.0036	.0032	.28
18.300	.0036	.0032	.28
18.400	.0036	.0032	.28
18.500	.0036	.0032	.28
18.600	.0036	.0032	.28
18.700	.0036	.0032	.28
18.800	.0036	.0032	.28
18.900	.0036	.0032	.28
19.000	.0036	.0032	.28
19.100	.0036	.0032	.28
19.200	.0036	.0032	.28
19.300	.0036	.0032	.28
19.400	.0036	.0032	.28
19.500	.0036	.0032	.28
19.600	.0036	.0032	.28
19.700	.0036	.0032	.28
19.800	.0036	.0032	.28
19.900	.0036	.0032	.28
20.000	.0036	.0032	.28
20.100	.0024	.0021	.28
20.200	.0024	.0021	.20
20.300	.0024	.0021	.19
20.400	.0024	.0021	.19
20.500	.0024	.0021	.19
20.600	.0024	.0021	.19

20.700	.0024	.0021	.19
20.800	.0024	.0021	.19
20.900	.0024	.0021	.19
21.000	.0024	.0021	.19
21.100	.0024	.0021	.19
21.200	.0024	.0021	.19
21.300	.0024	.0021	.19
21.400	.0024	.0021	.19
21.500	.0024	.0021	.19
21.600	.0024	.0021	.19
21.700	.0024	.0021	.19
21.800	.0024	.0021	.19
21.900	.0024	.0021	.19
22.000	.0024	.0021	.19
22.100	.0024	.0021	.19
22.200	.0024	.0021	.19
22.300	.0024	.0021	.19
22.400	.0024	.0021	.19
22.500	.0024	.0021	.19
22.600	.0024	.0021	.19
22.700	.0024	.0021	.19
22.800	.0024	.0021	.19
22.900	.0024	.0021	.19
23.000	.0024	.0021	.19
23.100	.0024	.0021	.19
23.200	.0024	.0021	.19
23.300	.0024	.0021	.19
23.400	.0024	.0021	.19
23.500	.0024	.0021	.19
23.600	.0024	.0021	.19
23.700	.0024	.0021	.19
23.800	.0024	.0021	.19
23.900	.0024	.0021	.19
24.000	.0024	.0021	.19
24.100	.0000	.0000	.19
24.200	.0000	.0000	.03
24.300	.0000	.0000	.00
24.400	.0000	.0000	.00
TOTALS	2.000	1.2370	108.44

STORM HYDROGRAPH VOLUME = .90 ACRE-FEET
MAXIMUN STORM DISCHARGE = 15.12 CFS

ITEX, Drainage "B" Runon, 25-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 2.000 DURATION = 24.0 RUNOFF = 1.237
STORM DISTRIBUTION IS SCS 24-HR
CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
.000	.0000	.0000	.00
.100	.0024	.0000	.00
.200	.0024	.0000	.00
.300	.0024	.0000	.00
.400	.0024	.0000	.00
.500	.0024	.0000	.00
.600	.0024	.0000	.00
.700	.0024	.0000	.00
.800	.0024	.0000	.00
.900	.0024	.0000	.00
1.000	.0024	.0000	.00
		NO RUNOFF	
6.400	.0040	.0000	.00
6.500	.0040	.0000	.00
6.600	.0040	.0001	.01
6.700	.0040	.0001	.02
6.800	.0040	.0001	.03
6.900	.0040	.0002	.04
7.000	.0040	.0002	.06
7.100	.0040	.0002	.07
7.200	.0040	.0003	.08
7.300	.0040	.0003	.10
7.400	.0040	.0003	.11
7.500	.0040	.0004	.12
7.600	.0040	.0004	.13
7.700	.0040	.0004	.15
7.800	.0040	.0005	.16
7.900	.0040	.0005	.17
8.000	.0040	.0005	.18
8.100	.0054	.0008	.19
8.200	.0054	.0008	.23
8.300	.0054	.0009	.28
8.400	.0054	.0009	.31
8.500	.0054	.0010	.33
8.600	.0054	.0010	.35
8.700	.0054	.0011	.37
8.800	.0054	.0011	.39
8.900	.0054	.0012	.41
9.000	.0054	.0012	.43
9.100	.0064	.0015	.45
9.200	.0064	.0016	.50
9.300	.0064	.0016	.56
9.400	.0064	.0017	.59
9.500	.0064	.0017	.62
9.600	.0072	.0020	.64

9.700	.0072	.0021	.70
9.800	.0072	.0022	.76
9.900	.0072	.0022	.80
10.000	.0072	.0023	.83
10.100	.0092	.0030	.86
10.200	.0092	.0031	.98
10.300	.0092	.0032	1.12
10.400	.0092	.0033	1.19
10.500	.0092	.0034	1.24
10.600	.0124	.0048	1.28
10.700	.0124	.0050	1.51
10.800	.0124	.0051	1.75
10.900	.0124	.0053	1.87
11.000	.0124	.0054	1.95
11.100	.0192	.0087	2.02
11.200	.0192	.0090	2.55
11.300	.0192	.0093	3.12
11.400	.0192	.0096	3.39
11.500	.0192	.0099	3.56
11.600	.0832	.0461	3.69
11.700	.0832	.0504	9.30
11.800	.1520	.1011	15.58
11.900	.2208	.1621	25.81
12.000	.2208	.1749	43.83
12.100	.0288	.0235	58.07
12.200	.0288	.0237	40.86
12.300	.0288	.0238	19.52
12.400	.0288	.0240	12.61
12.500	.0288	.0241	10.07
12.600	.0148	.0124	9.15
12.700	.0148	.0125	7.40
12.800	.0148	.0125	5.61
12.900	.0148	.0125	5.04
13.000	.0148	.0126	4.84
13.100	.0108	.0092	4.78
13.200	.0108	.0092	4.27
13.300	.0108	.0092	3.75
13.400	.0108	.0092	3.59
13.500	.0108	.0092	3.54
13.600	.0084	.0072	3.52
13.700	.0084	.0072	3.21
13.800	.0084	.0072	2.90
13.900	.0084	.0072	2.80
14.000	.0084	.0072	2.77
14.100	.0060	.0052	2.76
14.200	.0060	.0052	2.44
14.300	.0060	.0052	2.13
14.400	.0060	.0052	2.02
14.500	.0060	.0052	1.99
14.600	.0060	.0052	1.98
14.700	.0060	.0052	1.98
14.800	.0060	.0052	1.98
14.900	.0060	.0052	1.98
15.000	.0060	.0052	1.98
15.100	.0060	.0052	1.99

15.200	.0060	.0052	1.99
15.300	.0060	.0052	1.99
15.400	.0060	.0052	1.99
15.500	.0060	.0052	1.99
15.600	.0060	.0052	1.99
15.700	.0060	.0052	2.00
15.800	.0060	.0052	2.00
15.900	.0060	.0052	2.00
16.000	.0060	.0052	2.00
16.100	.0036	.0031	2.00
16.200	.0036	.0032	1.68
16.300	.0036	.0032	1.36
16.400	.0036	.0032	1.25
16.500	.0036	.0032	1.22
16.600	.0036	.0032	1.20
16.700	.0036	.0032	1.20
16.800	.0036	.0032	1.20
16.900	.0036	.0032	1.21
17.000	.0036	.0032	1.21
17.100	.0036	.0032	1.21
17.200	.0036	.0032	1.21
17.300	.0036	.0032	1.21
17.400	.0036	.0032	1.21
17.500	.0036	.0032	1.21
17.600	.0036	.0032	1.21
17.700	.0036	.0032	1.21
17.800	.0036	.0032	1.21
17.900	.0036	.0032	1.21
18.000	.0036	.0032	1.21
18.100	.0036	.0032	1.21
18.200	.0036	.0032	1.21
18.300	.0036	.0032	1.21
18.400	.0036	.0032	1.21
18.500	.0036	.0032	1.21
18.600	.0036	.0032	1.21
18.700	.0036	.0032	1.21
18.800	.0036	.0032	1.21
18.900	.0036	.0032	1.21
19.000	.0036	.0032	1.21
19.100	.0036	.0032	1.22
19.200	.0036	.0032	1.22
19.300	.0036	.0032	1.22
19.400	.0036	.0032	1.22
19.500	.0036	.0032	1.22
19.600	.0036	.0032	1.22
19.700	.0036	.0032	1.22
19.800	.0036	.0032	1.22
19.900	.0036	.0032	1.22
20.000	.0036	.0032	1.22
20.100	.0024	.0021	1.22
20.200	.0024	.0021	1.06
20.300	.0024	.0021	.89
20.400	.0024	.0021	.84
20.500	.0024	.0021	.82
20.600	.0024	.0021	.81

20.700	.0024	.0021	.81
20.800	.0024	.0021	.81
20.900	.0024	.0021	.81
21.000	.0024	.0021	.81
21.100	.0024	.0021	.82
21.200	.0024	.0021	.82
21.300	.0024	.0021	.82
21.400	.0024	.0021	.82
21.500	.0024	.0021	.82
21.600	.0024	.0021	.82
21.700	.0024	.0021	.82
21.800	.0024	.0021	.82
21.900	.0024	.0021	.82
22.000	.0024	.0021	.82
22.100	.0024	.0021	.82
22.200	.0024	.0021	.82
22.300	.0024	.0021	.82
22.400	.0024	.0021	.82
22.500	.0024	.0021	.82
22.600	.0024	.0021	.82
22.700	.0024	.0021	.82
22.800	.0024	.0021	.82
22.900	.0024	.0021	.82
23.000	.0024	.0021	.82
23.100	.0024	.0021	.82
23.200	.0024	.0021	.82
23.300	.0024	.0021	.82
23.400	.0024	.0021	.82
23.500	.0024	.0021	.82
23.600	.0024	.0021	.82
23.700	.0024	.0021	.82
23.800	.0024	.0021	.82
23.900	.0024	.0021	.82
24.000	.0024	.0021	.82
24.100	.0000	.0000	.82
24.200	.0000	.0000	.49
24.300	.0000	.0000	.16
24.400	.0000	.0000	.05
24.500	.0000	.0000	.01
24.600	.0000	.0000	.00
TOTALS	2.000	1.2370	472.13

STORM HYDROGRAPH VOLUME = 3.90 ACRE-FEET
MAXIMUN STORM DISCHARGE = 58.07 CFS

ITEX, Drainage "C" Runon, 25-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 2.000 DURATION = 24.0 RUNOFF = 1.237
STORM DISTRIBUTION IS SCS 24-HR
CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
.000	.0000	.0000	.00
.100	.0024	.0000	.00
.200	.0024	.0000	.00
.300	.0024	.0000	.00
.400	.0024	.0000	.00
.500	.0024	.0000	.00
.600	.0024	.0000	.00
.700	.0024	.0000	.00
.800	.0024	.0000	.00
.900	.0024	.0000	.00
1.000	.0024	.0000	.00
		NO RUNOFF	
6.400	.0040	.0000	.00
6.500	.0040	.0000	.00
6.600	.0040	.0001	.03
6.700	.0040	.0001	.07
6.800	.0040	.0001	.12
6.900	.0040	.0002	.16
7.000	.0040	.0002	.20
7.100	.0040	.0002	.25
7.200	.0040	.0003	.29
7.300	.0040	.0003	.33
7.400	.0040	.0003	.37
7.500	.0040	.0004	.41
7.600	.0040	.0004	.45
7.700	.0040	.0004	.49
7.800	.0040	.0005	.53
7.900	.0040	.0005	.57
8.000	.0040	.0005	.60
8.100	.0054	.0008	.64
8.200	.0054	.0008	.85
8.300	.0054	.0009	.97
8.400	.0054	.0009	1.05
8.500	.0054	.0010	1.11
8.600	.0054	.0010	1.17
8.700	.0054	.0011	1.24
8.800	.0054	.0011	1.30
8.900	.0054	.0012	1.36
9.000	.0054	.0012	1.42
9.100	.0064	.0015	1.47
9.200	.0064	.0016	1.73
9.300	.0064	.0016	1.87
9.400	.0064	.0017	1.97
9.500	.0064	.0017	2.05
9.600	.0072	.0020	2.12

9.700	.0072	.0021	2.38
9.800	.0072	.0022	2.54
9.900	.0072	.0022	2.64
10.000	.0072	.0023	2.73
10.100	.0092	.0030	2.82
10.200	.0092	.0031	3.45
10.300	.0092	.0032	3.78
10.400	.0092	.0033	3.96
10.500	.0092	.0034	4.09
10.600	.0124	.0048	4.21
10.700	.0124	.0050	5.37
10.800	.0124	.0051	5.95
10.900	.0124	.0053	6.24
11.000	.0124	.0054	6.45
11.100	.0192	.0087	6.65
11.200	.0192	.0090	9.41
11.300	.0192	.0093	10.74
11.400	.0192	.0096	11.36
11.500	.0192	.0099	11.80
11.600	.0832	.0461	12.17
11.700	.0832	.0504	42.26
11.800	.1520	.1011	57.34
11.900	.2208	.1621	103.47
12.000	.2208	.1749	171.02
12.100	.0288	.0235	204.99
12.200	.0288	.0237	89.22
12.300	.0288	.0238	43.38
12.400	.0288	.0240	31.98
12.500	.0288	.0241	29.64
12.600	.0148	.0124	29.80
12.700	.0148	.0125	20.19
12.800	.0148	.0125	16.53
12.900	.0148	.0125	15.66
13.000	.0148	.0126	15.51
13.100	.0108	.0092	15.55
13.200	.0108	.0092	12.76
13.300	.0108	.0092	11.71
13.400	.0108	.0092	11.47
13.500	.0108	.0092	11.43
13.600	.0084	.0072	11.45
13.700	.0084	.0072	9.76
13.800	.0084	.0072	9.12
13.900	.0084	.0072	8.97
14.000	.0084	.0072	8.95
14.100	.0060	.0052	8.96
14.200	.0060	.0052	7.26
14.300	.0060	.0052	6.61
14.400	.0060	.0052	6.45
14.500	.0060	.0052	6.42
14.600	.0060	.0052	6.43
14.700	.0060	.0052	6.43
14.800	.0060	.0052	6.44
14.900	.0060	.0052	6.44
15.000	.0060	.0052	6.45
15.100	.0060	.0052	6.45

15.200	.0060	.0052	6.46
15.300	.0060	.0052	6.46
15.400	.0060	.0052	6.47
15.500	.0060	.0052	6.47
15.600	.0060	.0052	6.48
15.700	.0060	.0052	6.48
15.800	.0060	.0052	6.49
15.900	.0060	.0052	6.49
16.000	.0060	.0052	6.50
16.100	.0036	.0031	6.50
16.200	.0036	.0032	4.77
16.300	.0036	.0032	4.10
16.400	.0036	.0032	3.94
16.500	.0036	.0032	3.91
16.600	.0036	.0032	3.91
16.700	.0036	.0032	3.91
16.800	.0036	.0032	3.91
16.900	.0036	.0032	3.91
17.000	.0036	.0032	3.92
17.100	.0036	.0032	3.92
17.200	.0036	.0032	3.92
17.300	.0036	.0032	3.92
17.400	.0036	.0032	3.92
17.500	.0036	.0032	3.92
17.600	.0036	.0032	3.93
17.700	.0036	.0032	3.93
17.800	.0036	.0032	3.93
17.900	.0036	.0032	3.93
18.000	.0036	.0032	3.93
18.100	.0036	.0032	3.93
18.200	.0036	.0032	3.93
18.300	.0036	.0032	3.94
18.400	.0036	.0032	3.94
18.500	.0036	.0032	3.94
18.600	.0036	.0032	3.94
18.700	.0036	.0032	3.94
18.800	.0036	.0032	3.94
18.900	.0036	.0032	3.95
19.000	.0036	.0032	3.95
19.100	.0036	.0032	3.95
19.200	.0036	.0032	3.95
19.300	.0036	.0032	3.95
19.400	.0036	.0032	3.95
19.500	.0036	.0032	3.95
19.600	.0036	.0032	3.96
19.700	.0036	.0032	3.96
19.800	.0036	.0032	3.96
19.900	.0036	.0032	3.96
20.000	.0036	.0032	3.96
20.100	.0024	.0021	3.96
20.200	.0024	.0021	3.08
20.300	.0024	.0021	2.74
20.400	.0024	.0021	2.66
20.500	.0024	.0021	2.64
20.600	.0024	.0021	2.64

20.700	.0024	.0021	2.65
20.800	.0024	.0021	2.65
20.900	.0024	.0021	2.65
21.000	.0024	.0021	2.65
21.100	.0024	.0021	2.65
21.200	.0024	.0021	2.65
21.300	.0024	.0021	2.65
21.400	.0024	.0021	2.65
21.500	.0024	.0021	2.65
21.600	.0024	.0021	2.65
21.700	.0024	.0021	2.65
21.800	.0024	.0021	2.65
21.900	.0024	.0021	2.65
22.000	.0024	.0021	2.65
22.100	.0024	.0021	2.65
22.200	.0024	.0021	2.65
22.300	.0024	.0021	2.65
22.400	.0024	.0021	2.66
22.500	.0024	.0021	2.66
22.600	.0024	.0021	2.66
22.700	.0024	.0021	2.66
22.800	.0024	.0021	2.66
22.900	.0024	.0021	2.66
23.000	.0024	.0021	2.66
23.100	.0024	.0021	2.66
23.200	.0024	.0021	2.66
23.300	.0024	.0021	2.66
23.400	.0024	.0021	2.66
23.500	.0024	.0021	2.66
23.600	.0024	.0021	2.66
23.700	.0024	.0021	2.66
23.800	.0024	.0021	2.66
23.900	.0024	.0021	2.66
24.000	.0024	.0021	2.66
24.100	.0000	.0000	2.66
24.200	.0000	.0000	.88
24.300	.0000	.0000	.20
24.400	.0000	.0000	.04
24.500	.0000	.0000	.00
TOTALS	2.000	1.2370	1533.46

STORM HYDROGRAPH VOLUME = 12.67 ACRE-FEET
MAXIMUN STORM DISCHARGE = 204.99 CFS

ITEX, Drainage "D" Runon, 25-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 2.000 DURATION = 24.0 RUNOFF = 1.237
STORM DISTRIBUTION IS SCS 24-HR
CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
.000	.0000	.0000	.00
.100	.0024	.0000	.00
.200	.0024	.0000	.00
.300	.0024	.0000	.00
.400	.0024	.0000	.00
.500	.0024	.0000	.00
.600	.0024	.0000	.00
.700	.0024	.0000	.00
.800	.0024	.0000	.00
.900	.0024	.0000	.00
1.000	.0024	.0000	.00
	NO RUNOFF		
6.400	.0040	.0000	.00
6.500	.0040	.0000	.00
6.600	.0040	.0001	.01
6.700	.0040	.0001	.03
6.800	.0040	.0001	.06
6.900	.0040	.0002	.09
7.000	.0040	.0002	.12
7.100	.0040	.0002	.15
7.200	.0040	.0003	.19
7.300	.0040	.0003	.22
7.400	.0040	.0003	.25
7.500	.0040	.0004	.28
7.600	.0040	.0004	.30
7.700	.0040	.0004	.33
7.800	.0040	.0005	.36
7.900	.0040	.0005	.39
8.000	.0040	.0005	.42
8.100	.0054	.0008	.44
8.200	.0054	.0008	.52
8.300	.0054	.0009	.63
8.400	.0054	.0009	.71
8.500	.0054	.0010	.76
8.600	.0054	.0010	.82
8.700	.0054	.0011	.86
8.800	.0054	.0011	.91
8.900	.0054	.0012	.95
9.000	.0054	.0012	.99
9.100	.0064	.0015	1.04
9.200	.0064	.0016	1.14
9.300	.0064	.0016	1.27
9.400	.0064	.0017	1.36
9.500	.0064	.0017	1.43
9.600	.0072	.0020	1.49

9.700	.0072	.0021	1.61
9.800	.0072	.0022	1.75
9.900	.0072	.0022	1.85
10.000	.0072	.0023	1.92
10.100	.0092	.0030	1.99
10.200	.0092	.0031	2.23
10.300	.0092	.0032	2.55
10.400	.0092	.0033	2.74
10.500	.0092	.0034	2.87
10.600	.0124	.0048	2.98
10.700	.0124	.0050	3.39
10.800	.0124	.0051	3.97
10.900	.0124	.0053	4.31
11.000	.0124	.0054	4.53
11.100	.0192	.0087	4.70
11.200	.0192	.0090	5.64
11.300	.0192	.0093	7.00
11.400	.0192	.0096	7.76
11.500	.0192	.0099	8.23
11.600	.0832	.0461	8.59
11.700	.0832	.0504	18.01
11.800	.1520	.1011	32.80
11.900	.2208	.1621	53.31
12.000	.2208	.1749	90.93
12.100	.0288	.0235	126.84
12.200	.0288	.0237	107.03
12.300	.0288	.0238	57.63
12.400	.0288	.0240	35.80
12.500	.0288	.0241	27.20
12.600	.0148	.0124	23.13
12.700	.0148	.0125	18.64
12.800	.0148	.0125	14.30
12.900	.0148	.0125	12.40
13.000	.0148	.0126	11.68
13.100	.0108	.0092	11.38
13.200	.0108	.0092	10.42
13.300	.0108	.0092	9.16
13.400	.0108	.0092	8.61
13.500	.0108	.0092	8.41
13.600	.0084	.0072	8.33
13.700	.0084	.0072	7.78
13.800	.0084	.0072	7.02
13.900	.0084	.0072	6.69
14.000	.0084	.0072	6.57
14.100	.0060	.0052	6.51
14.200	.0060	.0052	5.97
14.300	.0060	.0052	5.20
14.400	.0060	.0052	4.87
14.500	.0060	.0052	4.74
14.600	.0060	.0052	4.68
14.700	.0060	.0052	4.66
14.800	.0060	.0052	4.67
14.900	.0060	.0052	4.67
15.000	.0060	.0052	4.67
15.100	.0060	.0052	4.68

15.200	.0060	.0052	4.68
15.300	.0060	.0052	4.69
15.400	.0060	.0052	4.69
15.500	.0060	.0052	4.69
15.600	.0060	.0052	4.70
15.700	.0060	.0052	4.70
15.800	.0060	.0052	4.70
15.900	.0060	.0052	4.71
16.000	.0060	.0052	4.71
16.100	.0036	.0031	4.71
16.200	.0036	.0032	4.18
16.300	.0036	.0032	3.39
16.400	.0036	.0032	3.05
16.500	.0036	.0032	2.92
16.600	.0036	.0032	2.86
16.700	.0036	.0032	2.84
16.800	.0036	.0032	2.84
16.900	.0036	.0032	2.84
17.000	.0036	.0032	2.84
17.100	.0036	.0032	2.84
17.200	.0036	.0032	2.84
17.300	.0036	.0032	2.84
17.400	.0036	.0032	2.84
17.500	.0036	.0032	2.85
17.600	.0036	.0032	2.85
17.700	.0036	.0032	2.85
17.800	.0036	.0032	2.85
17.900	.0036	.0032	2.85
18.000	.0036	.0032	2.85
18.100	.0036	.0032	2.85
18.200	.0036	.0032	2.85
18.300	.0036	.0032	2.85
18.400	.0036	.0032	2.86
18.500	.0036	.0032	2.86
18.600	.0036	.0032	2.86
18.700	.0036	.0032	2.86
18.800	.0036	.0032	2.86
18.900	.0036	.0032	2.86
19.000	.0036	.0032	2.86
19.100	.0036	.0032	2.86
19.200	.0036	.0032	2.86
19.300	.0036	.0032	2.86
19.400	.0036	.0032	2.87
19.500	.0036	.0032	2.87
19.600	.0036	.0032	2.87
19.700	.0036	.0032	2.87
19.800	.0036	.0032	2.87
19.900	.0036	.0032	2.87
20.000	.0036	.0032	2.87
20.100	.0024	.0021	2.87
20.200	.0024	.0021	2.60
20.300	.0024	.0021	2.20
20.400	.0024	.0021	2.03
20.500	.0024	.0021	1.96
20.600	.0024	.0021	1.93

20.700	.0024	.0021	1.92
20.800	.0024	.0021	1.92
20.900	.0024	.0021	1.92
21.000	.0024	.0021	1.92
21.100	.0024	.0021	1.92
21.200	.0024	.0021	1.92
21.300	.0024	.0021	1.92
21.400	.0024	.0021	1.92
21.500	.0024	.0021	1.92
21.600	.0024	.0021	1.92
21.700	.0024	.0021	1.92
21.800	.0024	.0021	1.92
21.900	.0024	.0021	1.92
22.000	.0024	.0021	1.92
22.100	.0024	.0021	1.92
22.200	.0024	.0021	1.92
22.300	.0024	.0021	1.93
22.400	.0024	.0021	1.93
22.500	.0024	.0021	1.93
22.600	.0024	.0021	1.93
22.700	.0024	.0021	1.93
22.800	.0024	.0021	1.93
22.900	.0024	.0021	1.93
23.000	.0024	.0021	1.93
23.100	.0024	.0021	1.93
23.200	.0024	.0021	1.93
23.300	.0024	.0021	1.93
23.400	.0024	.0021	1.93
23.500	.0024	.0021	1.93
23.600	.0024	.0021	1.93
23.700	.0024	.0021	1.93
23.800	.0024	.0021	1.93
23.900	.0024	.0021	1.93
24.000	.0024	.0021	1.93
24.100	.0000	.0000	1.93
24.200	.0000	.0000	1.39
24.300	.0000	.0000	.58
24.400	.0000	.0000	.22
24.500	.0000	.0000	.08
24.600	.0000	.0000	.02
24.700	.0000	.0000	.00
TOTALS	2.000	1.2370	1112.24

STORM HYDROGRAPH VOLUME = 9.19 ACRE-FEET
MAXIMUN STORM DISCHARGE = 126.84 CFS

ITEX, Drainage "A" Runon, 10-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 1.600 DURATION = 24.0 RUNOFF = .886

STORM DISTRIBUTION IS SCS 24-HR

CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
23.500	.0019	.0016	.14
23.600	.0019	.0016	.14
23.700	.0019	.0016	.14
23.800	.0019	.0016	.14
23.900	.0019	.0016	.14
24.000	.0019	.0016	.14
24.100	.0000	.0000	.14
24.200	.0000	.0000	.02
24.300	.0000	.0000	.00
24.400	.0000	.0000	.00
TOTALS	1.600	.8859	77.66

STORM HYDROGRAPH VOLUME = .64 ACRE-FEET

MAXIMUN STORM DISCHARGE = 11.07 CFS

ITEX, Drainage "B" Runon, 10-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 1.600 DURATION = 24.0 RUNOFF = .886

STORM DISTRIBUTION IS SCS 24-HR

CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
23.800	.0019	.0016	.63
23.900	.0019	.0016	.63
24.000	.0019	.0016	.63
24.100	.0000	.0000	.63
24.200	.0000	.0000	.38
24.300	.0000	.0000	.12
24.400	.0000	.0000	.04
24.500	.0000	.0000	.01
24.600	.0000	.0000	.00
TOTALS	1.600	.8859	338.12

STORM HYDROGRAPH VOLUME = 2.79 ACRE-FEET

MAXIMUN STORM DISCHARGE = 41.98 CFS

ITEX, Drainage "C" Runon, 10-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 1.600 DURATION = 24.0 RUNOFF = .886

STORM DISTRIBUTION IS SCS 24-HR

CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
23.100	.0019	.0016	2.03
23.200	.0019	.0016	2.03
23.300	.0019	.0016	2.03
23.400	.0019	.0016	2.03
23.500	.0019	.0016	2.03
23.600	.0019	.0016	2.04
23.700	.0019	.0016	2.04
23.800	.0019	.0016	2.04
23.900	.0019	.0016	2.04
24.000	.0019	.0016	2.04
24.100	.0000	.0000	2.04
24.200	.0000	.0000	.68
24.300	.0000	.0000	.16
24.400	.0000	.0000	.03
24.500	.0000	.0000	.00
TOTALS	1.600	.8859	1098.20

STORM HYDROGRAPH VOLUME = 9.08 ACRE-FEET

MAXIMUN STORM DISCHARGE = 149.38 CFS

ITEX, Drainage "D" Runon, 10-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 1.600 DURATION = 24.0 RUNOFF = .886

STORM DISTRIBUTION IS SCS 24-HR

CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
23.400	.0019	.0016	1.50
23.500	.0019	.0016	1.50
23.600	.0019	.0016	1.50
23.700	.0019	.0016	1.50
23.800	.0019	.0016	1.50
23.900	.0019	.0016	1.50
24.000	.0019	.0016	1.50
24.100	.0000	.0000	1.50
24.200	.0000	.0000	.50
24.300	.0000	.0000	.11
24.400	.0000	.0000	.02
24.500	.0000	.0000	.00
TOTALS	1.600	.8859	809.20

STORM HYDROGRAPH VOLUME = 6.69 ACRE-FEET

MAXIMUN STORM DISCHARGE = 110.07 CFS

Purpose: Calculate runoff from upgradient area (0.25 mi^2) of the landfill. Assume both disturbed and undisturbed conditions.

Assume: Use SCS method to calculate runoff from landfill.
CN = 94 for disturbed areas. Viessman, 1989
CN = 92 for undisturbed areas.
$t_c \approx 0$, because runoff is instantaneous? → basically saying time of concentration (t_c) is zero because runoff is instaneous.
25 yr 24 hr storm = 2.0"
100 yr 24 hr storm = 2.5"
10 yr, 24 hr storm = 1.0"

not exactly sure, need to look in my Viessman book.

Results From STORM

Runoff from 0.25 $mile^2$ area (cfs)

	25-yr 24-hr	100-yr, 24-hr	10-yr, 24-hr
Disturbed	300	390	225
Undisturbed	270	365	

ITEX, Site Runoff (Disturbed, 0.25 sq. miles), 25-yr, 24 hr Storm
STORM HYDROGRAPH RAIN = 2.000 DURATION = 24.0 RUNOFF = 1.396
STORM DISTRIBUTION IS SCS 24-HR
CURVE NUMBER METHOD CN =94.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
.000	.0000	.0000	.00
.100	.0024	.0000	.00
.200	.0024	.0000	.00
.300	.0024	.0000	.00
.400	.0024	.0000	.00
.500	.0024	.0000	.00
		No Runoff	
4.900	.0032	.0000	.00
5.000	.0032	.0000	.00
5.100	.0032	.0000	.00
5.200	.0032	.0001	.02
5.300	.0032	.0001	.06
5.400	.0032	.0001	.11
5.500	.0032	.0001	.16
5.600	.0032	.0002	.21
5.700	.0032	.0002	.26
5.800	.0032	.0002	.31
5.900	.0032	.0003	.36
6.000	.0032	.0003	.40
6.100	.0040	.0004	.45
6.200	.0040	.0004	.59
6.300	.0040	.0005	.68
6.400	.0040	.0005	.76
6.500	.0040	.0006	.82
6.600	.0040	.0006	.89
6.700	.0040	.0006	.96
6.800	.0040	.0007	1.02
6.900	.0040	.0007	1.08
7.000	.0040	.0008	1.14
7.100	.0040	.0008	1.21
7.200	.0040	.0008	1.27
7.300	.0040	.0009	1.32
7.400	.0040	.0009	1.38
7.500	.0040	.0009	1.44
7.600	.0040	.0010	1.49
7.700	.0040	.0010	1.55
7.800	.0040	.0010	1.60
7.900	.0040	.0011	1.66
8.000	.0040	.0011	1.71
8.100	.0054	.0015	1.76
8.200	.0054	.0016	2.25
8.300	.0054	.0016	2.49
8.400	.0054	.0017	2.62
8.500	.0054	.0017	2.71
8.600	.0054	.0018	2.80

8.700	.0054	.0018	2.88
8.800	.0054	.0019	2.96
8.900	.0054	.0019	3.04
9.000	.0054	.0020	3.12
9.100	.0064	.0024	3.20
9.200	.0064	.0025	3.68
9.300	.0064	.0025	3.94
9.400	.0064	.0026	4.07
9.500	.0064	.0026	4.18
9.600	.0072	.0030	4.28
9.700	.0072	.0031	4.74
9.800	.0072	.0032	4.99
9.900	.0072	.0033	5.14
10.000	.0072	.0033	5.26
10.100	.0092	.0043	5.36
10.200	.0092	.0044	6.50
10.300	.0092	.0045	7.04
10.400	.0092	.0046	7.30
10.500	.0092	.0047	7.47
10.600	.0124	.0065	7.62
10.700	.0124	.0066	9.61
10.800	.0124	.0068	10.54
10.900	.0124	.0069	10.95
11.000	.0124	.0071	11.22
11.100	.0192	.0112	11.45
11.200	.0192	.0115	16.04
11.300	.0192	.0118	18.11
11.400	.0192	.0121	18.98
11.500	.0192	.0123	19.51
11.600	.0832	.0561	19.94
11.700	.0832	.0597	67.73
11.800	.1520	.1163	89.96
11.900	.2208	.1809	157.66
12.000	.2208	.1905	253.00
12.100	.0288	.0254	296.25
12.200	.0288	.0255	128.13
12.300	.0288	.0256	61.78
12.400	.0288	.0257	45.25
12.500	.0288	.0258	41.81
12.600	.0148	.0133	41.96
12.700	.0148	.0133	28.40
12.800	.0148	.0133	23.22
12.900	.0148	.0133	21.98
13.000	.0148	.0134	21.74
13.100	.0108	.0098	21.78
13.200	.0108	.0098	17.87
13.300	.0108	.0098	16.38
13.400	.0108	.0098	16.03
13.500	.0108	.0098	15.97
13.600	.0084	.0076	15.99
13.700	.0084	.0076	13.62
13.800	.0084	.0076	12.73
13.900	.0084	.0077	12.51
14.000	.0084	.0077	12.48
14.100	.0060	.0055	12.49

14.200	.0060	.0055	10.11
14.300	.0060	.0055	9.20
14.400	.0060	.0055	8.98
14.500	.0060	.0055	8.94
14.600	.0060	.0055	8.94
14.700	.0060	.0055	8.95
14.800	.0060	.0055	8.95
14.900	.0060	.0055	8.96
15.000	.0060	.0055	8.96
15.100	.0060	.0055	8.97
15.200	.0060	.0055	8.97
15.300	.0060	.0055	8.98
15.400	.0060	.0055	8.98
15.500	.0060	.0055	8.98
15.600	.0060	.0055	8.99
15.700	.0060	.0055	8.99
15.800	.0060	.0055	9.00
15.900	.0060	.0055	9.00
16.000	.0060	.0055	9.01
16.100	.0036	.0033	9.01
16.200	.0036	.0033	6.60
16.300	.0036	.0033	5.68
16.400	.0036	.0033	5.46
16.500	.0036	.0033	5.41
16.600	.0036	.0033	5.41
16.700	.0036	.0033	5.42
16.800	.0036	.0033	5.42
16.900	.0036	.0033	5.42
17.000	.0036	.0033	5.42
17.100	.0036	.0033	5.42
17.200	.0036	.0033	5.42
17.300	.0036	.0033	5.42
17.400	.0036	.0033	5.43
17.500	.0036	.0033	5.43
17.600	.0036	.0033	5.43
17.700	.0036	.0033	5.43
17.800	.0036	.0033	5.43
17.900	.0036	.0033	5.43
18.000	.0036	.0033	5.43
18.100	.0036	.0033	5.43
18.200	.0036	.0033	5.44
18.300	.0036	.0033	5.44
18.400	.0036	.0033	5.44
18.500	.0036	.0033	5.44
18.600	.0036	.0033	5.44
18.700	.0036	.0033	5.44
18.800	.0036	.0033	5.44
18.900	.0036	.0033	5.45
19.000	.0036	.0033	5.45
19.100	.0036	.0033	5.45
19.200	.0036	.0033	5.45
19.300	.0036	.0033	5.45
19.400	.0036	.0033	5.45
19.500	.0036	.0033	5.45
19.600	.0036	.0033	5.45

19.700	.0036	.0033	5.46
19.800	.0036	.0033	5.46
19.900	.0036	.0033	5.46
20.000	.0036	.0033	5.46
20.100	.0024	.0022	5.46
20.200	.0024	.0022	4.24
20.300	.0024	.0022	3.78
20.400	.0024	.0022	3.67
20.500	.0024	.0022	3.64
20.600	.0024	.0022	3.64
20.700	.0024	.0022	3.64
20.800	.0024	.0022	3.64
20.900	.0024	.0022	3.64
21.000	.0024	.0022	3.65
21.100	.0024	.0022	3.65
21.200	.0024	.0022	3.65
21.300	.0024	.0022	3.65
21.400	.0024	.0022	3.65
21.500	.0024	.0022	3.65
21.600	.0024	.0022	3.65
21.700	.0024	.0022	3.65
21.800	.0024	.0022	3.65
21.900	.0024	.0022	3.65
22.000	.0024	.0022	3.65
22.100	.0024	.0022	3.65
22.200	.0024	.0022	3.65
22.300	.0024	.0022	3.65
22.400	.0024	.0022	3.65
22.500	.0024	.0022	3.65
22.600	.0024	.0022	3.65
22.700	.0024	.0022	3.65
22.800	.0024	.0022	3.65
22.900	.0024	.0022	3.66
23.000	.0024	.0022	3.66
23.100	.0024	.0022	3.66
23.200	.0024	.0022	3.66
23.300	.0024	.0022	3.66
23.400	.0024	.0022	3.66
23.500	.0024	.0022	3.66
23.600	.0024	.0022	3.66
23.700	.0024	.0022	3.66
23.800	.0024	.0022	3.66
23.900	.0024	.0022	3.66
24.000	.0024	.0022	3.66
24.100	.0000	.0000	3.66
24.200	.0000	.0000	1.21
24.300	.0000	.0000	.28
24.400	.0000	.0000	.05
24.500	.0000	.0000	.00
TOTALS	2.000	1.3963	2277.54

STORM HYDROGRAPH VOLUME = 18.82 ACRE-FEET
MAXIMUM STORM DISCHARGE = 296.25 CFS

ITEX, Site Runoff (Undisturbed, 0.25 sq. miles), 25-yr, 24 hr Storm
STORM HYDROGRAPH RAIN = 2.000 DURATION = 24.0 RUNOFF = 1.237
STORM DISTRIBUTION IS SCS 24-HR
CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
.000	.0000	.0000	.00
.100	.0024	.0000	.00
.200	.0024	.0000	.00
.300	.0024	.0000	.00
	No Runoff		
6.200	.0040	.0000	.00
6.300	.0040	.0000	.00
6.400	.0040	.0000	.00
6.500	.0040	.0000	.01
6.600	.0040	.0001	.04
6.700	.0040	.0001	.10
6.800	.0040	.0001	.15
6.900	.0040	.0002	.21
7.000	.0040	.0002	.27
7.100	.0040	.0002	.32
7.200	.0040	.0003	.38
7.300	.0040	.0003	.43
7.400	.0040	.0003	.49
7.500	.0040	.0004	.54
7.600	.0040	.0004	.59
7.700	.0040	.0004	.64
7.800	.0040	.0005	.70
7.900	.0040	.0005	.75
8.000	.0040	.0005	.80
8.100	.0054	.0008	.84
8.200	.0054	.0008	1.11
8.300	.0054	.0009	1.27
8.400	.0054	.0009	1.38
8.500	.0054	.0010	1.46
8.600	.0054	.0010	1.55
8.700	.0054	.0011	1.63
8.800	.0054	.0011	1.71
8.900	.0054	.0012	1.79
9.000	.0054	.0012	1.86
9.100	.0064	.0015	1.94
9.200	.0064	.0016	2.27
9.300	.0064	.0016	2.46
9.400	.0064	.0017	2.59
9.500	.0064	.0017	2.69
9.600	.0072	.0020	2.79
9.700	.0072	.0021	3.13
9.800	.0072	.0022	3.34
9.900	.0072	.0022	3.47
10.000	.0072	.0023	3.59
10.100	.0092	.0030	3.70

10.200	.0092	.0031	4.54
10.300	.0092	.0032	4.97
10.400	.0092	.0033	5.20
10.500	.0092	.0034	5.38
10.600	.0124	.0048	5.54
10.700	.0124	.0050	7.07
10.800	.0124	.0051	7.82
10.900	.0124	.0053	8.21
11.000	.0124	.0054	8.49
11.100	.0192	.0087	8.74
11.200	.0192	.0090	12.38
11.300	.0192	.0093	14.13
11.400	.0192	.0096	14.95
11.500	.0192	.0099	15.52
11.600	.0832	.0461	16.01
11.700	.0832	.0504	55.61
11.800	.1520	.1011	75.44
11.900	.2208	.1621	136.14
12.000	.2208	.1749	225.03
12.100	.0288	.0235	269.72
12.200	.0288	.0237	117.40
12.300	.0288	.0238	57.07
12.400	.0288	.0240	42.08
12.500	.0288	.0241	39.00
12.600	.0148	.0124	39.21
12.700	.0148	.0125	26.57
12.800	.0148	.0125	21.75
12.900	.0148	.0125	20.61
13.000	.0148	.0126	20.41
13.100	.0108	.0092	20.46
13.200	.0108	.0092	16.79
13.300	.0108	.0092	15.41
13.400	.0108	.0092	15.09
13.500	.0108	.0092	15.04
13.600	.0084	.0072	15.06
13.700	.0084	.0072	12.84
13.800	.0084	.0072	12.00
13.900	.0084	.0072	11.81
14.000	.0084	.0072	11.78
14.100	.0060	.0052	11.79
14.200	.0060	.0052	9.55
14.300	.0060	.0052	8.69
14.400	.0060	.0052	8.49
14.500	.0060	.0052	8.45
14.600	.0060	.0052	8.46
14.700	.0060	.0052	8.46
14.800	.0060	.0052	8.47
14.900	.0060	.0052	8.48
15.000	.0060	.0052	8.48
15.100	.0060	.0052	8.49
15.200	.0060	.0052	8.50
15.300	.0060	.0052	8.50
15.400	.0060	.0052	8.51
15.500	.0060	.0052	8.52
15.600	.0060	.0052	8.52

15.700	.0060	.0052	8.53
15.800	.0060	.0052	8.54
15.900	.0060	.0052	8.54
16.000	.0060	.0052	8.55
16.100	.0036	.0031	8.55
16.200	.0036	.0032	6.27
16.300	.0036	.0032	5.40
16.400	.0036	.0032	5.19
16.500	.0036	.0032	5.14
16.600	.0036	.0032	5.14
16.700	.0036	.0032	5.15
16.800	.0036	.0032	5.15
16.900	.0036	.0032	5.15
17.000	.0036	.0032	5.15
17.100	.0036	.0032	5.15
17.200	.0036	.0032	5.16
17.300	.0036	.0032	5.16
17.400	.0036	.0032	5.16
17.500	.0036	.0032	5.16
17.600	.0036	.0032	5.17
17.700	.0036	.0032	5.17
17.800	.0036	.0032	5.17
17.900	.0036	.0032	5.17
18.000	.0036	.0032	5.17
18.100	.0036	.0032	5.18
18.200	.0036	.0032	5.18
18.300	.0036	.0032	5.18
18.400	.0036	.0032	5.18
18.500	.0036	.0032	5.18
18.600	.0036	.0032	5.18
18.700	.0036	.0032	5.19
18.800	.0036	.0032	5.19
18.900	.0036	.0032	5.19
19.000	.0036	.0032	5.19
19.100	.0036	.0032	5.19
19.200	.0036	.0032	5.20
19.300	.0036	.0032	5.20
19.400	.0036	.0032	5.20
19.500	.0036	.0032	5.20
19.600	.0036	.0032	5.20
19.700	.0036	.0032	5.21
19.800	.0036	.0032	5.21
19.900	.0036	.0032	5.21
20.000	.0036	.0032	5.21
20.100	.0024	.0021	5.21
20.200	.0024	.0021	4.05
20.300	.0024	.0021	3.61
20.400	.0024	.0021	3.50
20.500	.0024	.0021	3.48
20.600	.0024	.0021	3.48
20.700	.0024	.0021	3.48
20.800	.0024	.0021	3.48
20.900	.0024	.0021	3.48
21.000	.0024	.0021	3.48
21.100	.0024	.0021	3.48

21.200	.0024	.0021	3.48
21.300	.0024	.0021	3.49
21.400	.0024	.0021	3.49
21.500	.0024	.0021	3.49
21.600	.0024	.0021	3.49
21.700	.0024	.0021	3.49
21.800	.0024	.0021	3.49
21.900	.0024	.0021	3.49
22.000	.0024	.0021	3.49
22.100	.0024	.0021	3.49
22.200	.0024	.0021	3.49
22.300	.0024	.0021	3.49
22.400	.0024	.0021	3.49
22.500	.0024	.0021	3.49
22.600	.0024	.0021	3.50
22.700	.0024	.0021	3.50
22.800	.0024	.0021	3.50
22.900	.0024	.0021	3.50
23.000	.0024	.0021	3.50
23.100	.0024	.0021	3.50
23.200	.0024	.0021	3.50
23.300	.0024	.0021	3.50
23.400	.0024	.0021	3.50
23.500	.0024	.0021	3.50
23.600	.0024	.0021	3.50
23.700	.0024	.0021	3.50
23.800	.0024	.0021	3.50
23.900	.0024	.0021	3.51
24.000	.0024	.0021	3.51
24.100	.0000	.0000	3.51
24.200	.0000	.0000	1.16
24.300	.0000	.0000	.27
24.400	.0000	.0000	.05
24.500	.0000	.0000	.00
TOTALS	2.000	1.2370	2017.71

STORM HYDROGRAPH VOLUME = 16.68 ACRE-FEET
MAXIMUM STORM DISCHARGE = 269.72 CFS

ITEX, Site Runoff (Disturbed, 0.25 sq. miles), 100-yr, 24 hr Storm
STORM HYDROGRAPH RAIN = 2.500 DURATION = 24.0 RUNOFF = 1.869
STORM DISTRIBUTION IS SCS 24-HR
CURVE NUMBER METHOD CN =94.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
.000	.0000	.0000	.00
.100	.0030	.0000	.00
.200	.0030	.0000	.00
.300	.0030	.0000	.00
	No Runoff		
4.200	.0040	.0000	.00
4.300	.0040	.0000	.00
4.400	.0040	.0001	.03
4.500	.0040	.0001	.10
4.600	.0040	.0002	.17
4.700	.0040	.0002	.25
4.800	.0040	.0003	.33
4.900	.0040	.0003	.40
5.000	.0040	.0004	.48
5.100	.0040	.0004	.55
5.200	.0040	.0004	.62
5.300	.0040	.0005	.69
5.400	.0040	.0005	.76
5.500	.0040	.0006	.82
5.600	.0040	.0006	.89
5.700	.0040	.0006	.96
5.800	.0040	.0007	1.02
5.900	.0040	.0007	1.08
6.000	.0040	.0008	1.14
6.100	.0050	.0010	1.21
6.200	.0050	.0010	1.49
6.300	.0050	.0011	1.65
6.400	.0050	.0012	1.76
6.500	.0050	.0012	1.85
6.600	.0050	.0013	1.94
6.700	.0050	.0013	2.02
6.800	.0050	.0014	2.10
6.900	.0050	.0014	2.18
7.000	.0050	.0015	2.26
7.100	.0050	.0015	2.34
7.200	.0050	.0015	2.42
7.300	.0050	.0016	2.49
7.400	.0050	.0016	2.57
7.500	.0050	.0017	2.64
7.600	.0050	.0017	2.71
7.700	.0050	.0018	2.78
7.800	.0050	.0018	2.84
7.900	.0050	.0018	2.91
8.000	.0050	.0019	2.98
8.100	.0067	.0026	3.04
8.200	.0067	.0027	3.85
8.300	.0068	.0027	4.22

8.400	.0068	.0028	4.40
8.500	.0067	.0029	4.52
8.600	.0068	.0029	4.62
8.700	.0068	.0030	4.73
8.800	.0067	.0030	4.83
8.900	.0068	.0031	4.92
9.000	.0068	.0032	5.02
9.100	.0080	.0038	5.11
9.200	.0080	.0039	5.85
9.300	.0080	.0040	6.22
9.400	.0080	.0040	6.39
9.500	.0080	.0041	6.52
9.600	.0090	.0047	6.64
9.700	.0090	.0048	7.32
9.800	.0090	.0049	7.67
9.900	.0090	.0049	7.85
10.000	.0090	.0050	7.99
10.100	.0115	.0065	8.12
10.200	.0115	.0066	9.79
10.300	.0115	.0067	10.56
10.400	.0115	.0068	10.88
10.500	.0115	.0070	11.09
10.600	.0155	.0095	11.27
10.700	.0155	.0097	14.13
10.800	.0155	.0099	15.41
10.900	.0155	.0100	15.93
11.000	.0155	.0102	16.25
11.100	.0240	.0161	16.51
11.200	.0240	.0164	23.00
11.300	.0240	.0167	25.83
11.400	.0240	.0170	26.92
11.500	.0240	.0173	27.53
11.600	.1040	.0777	27.99
11.700	.1040	.0815	93.99
11.800	.1900	.1564	123.40
11.900	.2760	.2392	212.83
12.000	.2760	.2486	336.02
12.100	.0360	.0329	388.48
12.200	.0360	.0330	167.43
12.300	.0360	.0331	80.38
12.400	.0360	.0332	58.67
12.500	.0360	.0333	54.11
12.600	.0185	.0171	54.25
12.700	.0185	.0172	36.69
12.800	.0185	.0172	29.99
12.900	.0185	.0172	28.37
13.000	.0185	.0172	28.05
13.100	.0135	.0126	28.08
13.200	.0135	.0126	23.03
13.300	.0135	.0126	21.11
13.400	.0135	.0126	20.65
13.500	.0135	.0126	20.56
13.600	.0105	.0098	20.58
13.700	.0105	.0098	17.53
13.800	.0105	.0098	16.38
13.900	.0105	.0098	16.10
14.000	.0105	.0098	16.05

14.100	.0075	.0070	16.05
14.200	.0075	.0070	12.99
14.300	.0075	.0070	11.83
14.400	.0075	.0070	11.54
14.500	.0075	.0070	11.49
14.600	.0075	.0070	11.49
14.700	.0075	.0071	11.50
14.800	.0075	.0071	11.50
14.900	.0075	.0071	11.50
15.000	.0075	.0071	11.51
15.100	.0075	.0071	11.51
15.200	.0075	.0071	11.52
15.300	.0075	.0071	11.52
15.400	.0075	.0071	11.52
15.500	.0075	.0071	11.53
15.600	.0075	.0071	11.53
15.700	.0075	.0071	11.54
15.800	.0075	.0071	11.54
15.900	.0075	.0071	11.54
16.000	.0075	.0071	11.55
16.100	.0045	.0043	11.55
16.200	.0045	.0043	8.47
16.300	.0045	.0043	7.29
16.400	.0045	.0043	7.00
16.500	.0045	.0043	6.94
16.600	.0045	.0043	6.94
16.700	.0045	.0043	6.94
16.800	.0045	.0043	6.94
16.900	.0045	.0043	6.94
17.000	.0045	.0043	6.94
17.100	.0045	.0043	6.94
17.200	.0045	.0043	6.95
17.300	.0045	.0043	6.95
17.400	.0045	.0043	6.95
17.500	.0045	.0043	6.95
17.600	.0045	.0043	6.95
17.700	.0045	.0043	6.95
17.800	.0045	.0043	6.95
17.900	.0045	.0043	6.96
18.000	.0045	.0043	6.96
18.100	.0045	.0043	6.96
18.200	.0045	.0043	6.96
18.300	.0045	.0043	6.96
18.400	.0045	.0043	6.96
18.500	.0045	.0043	6.96
18.600	.0045	.0043	6.96
18.700	.0045	.0043	6.97
18.800	.0045	.0043	6.97
18.900	.0045	.0043	6.97
19.000	.0045	.0043	6.97
19.100	.0045	.0043	6.97
19.200	.0045	.0043	6.97
19.300	.0045	.0043	6.97
19.400	.0045	.0043	6.97
19.500	.0045	.0043	6.97
19.600	.0045	.0043	6.98
19.700	.0045	.0043	6.98

19.800	.0045	.0043	6.98
19.900	.0045	.0043	6.98
20.000	.0045	.0043	6.98
20.100	.0030	.0029	6.98
20.200	.0030	.0029	5.43
20.300	.0030	.0029	4.83
20.400	.0030	.0029	4.69
20.500	.0030	.0029	4.66
20.600	.0030	.0029	4.66
20.700	.0030	.0029	4.66
20.800	.0030	.0029	4.66
20.900	.0030	.0029	4.66
21.000	.0030	.0029	4.66
21.100	.0030	.0029	4.66
21.200	.0030	.0029	4.66
21.300	.0030	.0029	4.66
21.400	.0030	.0029	4.66
21.500	.0030	.0029	4.66
21.600	.0030	.0029	4.66
21.700	.0030	.0029	4.66
21.800	.0030	.0029	4.66
21.900	.0030	.0029	4.66
22.000	.0030	.0029	4.66
22.100	.0030	.0029	4.66
22.200	.0030	.0029	4.66
22.300	.0030	.0029	4.66
22.400	.0030	.0029	4.67
22.500	.0030	.0029	4.67
22.600	.0030	.0029	4.67
22.700	.0030	.0029	4.67
22.800	.0030	.0029	4.67
22.900	.0030	.0029	4.67
23.000	.0030	.0029	4.67
23.100	.0030	.0029	4.67
23.200	.0030	.0029	4.67
23.300	.0030	.0029	4.67
23.400	.0030	.0029	4.67
23.500	.0030	.0029	4.67
23.600	.0030	.0029	4.67
23.700	.0030	.0029	4.67
23.800	.0030	.0029	4.67
23.900	.0030	.0029	4.67
24.000	.0030	.0029	4.67
24.100	.0000	.0000	4.67
24.200	.0000	.0000	1.55
24.300	.0000	.0000	.36
24.400	.0000	.0000	.06
24.500	.0000	.0000	.00
TOTALS	2.500	1.8694	3049.13

STORM HYDROGRAPH VOLUME = 25.20 ACRE-FEET
MAXIMUM STORM DISCHARGE = 388.48 CFS

ITEX, Site Runoff (Undisturbed, 0.25 sq. miles), 100-yr, 24 hr Storm
STORM HYDROGRAPH RAIN = 2.500 DURATION = 24.0 RUNOFF = 1.693
STORM DISTRIBUTION IS SCS 24-HR
CURVE NUMBER METHOD CN =92.0

TIME (HOURS)	RAINFALL (INCHES)		NET RAIN (INCHES)	DISCHARGE (CFS)
.000	.0000	.0000	.00	
.100	.0030	.0000	.00	
.200	.0030	.0000	.00	
.300	.0030	.0000	.00	
	No Runoff			
5.300	.0040	.0000	.00	
5.400	.0040	.0000	.00	
5.500	.0040	.0000	.01	
5.600	.0040	.0001	.04	
5.700	.0040	.0001	.10	
5.800	.0040	.0001	.15	
5.900	.0040	.0002	.21	
6.000	.0040	.0002	.27	
6.100	.0050	.0003	.32	
6.200	.0050	.0004	.45	
6.300	.0050	.0004	.55	
6.400	.0050	.0005	.64	
6.500	.0050	.0005	.73	
6.600	.0050	.0006	.81	
6.700	.0050	.0006	.89	
6.800	.0050	.0007	.96	
6.900	.0050	.0007	1.04	
7.000	.0050	.0007	1.12	
7.100	.0050	.0008	1.19	
7.200	.0050	.0008	1.27	
7.300	.0050	.0009	1.34	
7.400	.0050	.0009	1.41	
7.500	.0050	.0010	1.48	
7.600	.0050	.0010	1.55	
7.700	.0050	.0010	1.62	
7.800	.0050	.0011	1.68	
7.900	.0050	.0011	1.75	
8.000	.0050	.0012	1.81	
8.100	.0067	.0016	1.88	
8.200	.0067	.0017	2.41	
8.300	.0068	.0018	2.68	
8.400	.0068	.0018	2.83	
8.500	.0067	.0019	2.95	
8.600	.0068	.0020	3.06	
8.700	.0068	.0020	3.16	
8.800	.0067	.0021	3.26	
8.900	.0068	.0021	3.36	
9.000	.0068	.0022	3.46	
9.100	.0080	.0027	3.56	
9.200	.0080	.0028	4.11	

9.300	.0080	.0028	4.41
9.400	.0080	.0029	4.58
9.500	.0080	.0030	4.71
9.600	.0090	.0035	4.83
9.700	.0090	.0035	5.37
9.800	.0090	.0036	5.67
9.900	.0090	.0037	5.85
10.000	.0090	.0038	6.00
10.100	.0115	.0050	6.14
10.200	.0115	.0051	7.46
10.300	.0115	.0052	8.10
10.400	.0115	.0053	8.41
10.500	.0115	.0055	8.63
10.600	.0155	.0075	8.83
10.700	.0155	.0077	11.16
10.800	.0155	.0079	12.25
10.900	.0155	.0081	12.76
11.000	.0155	.0083	13.11
11.100	.0240	.0132	13.41
11.200	.0240	.0136	18.83
11.300	.0240	.0139	21.31
11.400	.0240	.0143	22.38
11.500	.0240	.0146	23.06
11.600	.1040	.0668	23.62
11.700	.1040	.0716	80.69
11.800	.1900	.1405	107.73
11.900	.2760	.2202	190.17
12.000	.2760	.2333	307.41
12.100	.0360	.0312	362.05
12.200	.0360	.0313	156.83
12.300	.0360	.0314	75.78
12.400	.0360	.0316	55.60
12.500	.0360	.0317	51.40
12.600	.0185	.0163	51.61
12.700	.0185	.0164	34.94
12.800	.0185	.0164	28.58
12.900	.0185	.0164	27.06
13.000	.0185	.0165	26.77
13.100	.0135	.0120	26.82
13.200	.0135	.0120	22.01
13.300	.0135	.0121	20.18
13.400	.0135	.0121	19.75
13.500	.0135	.0121	19.68
13.600	.0105	.0094	19.70
13.700	.0105	.0094	16.79
13.800	.0105	.0094	15.69
13.900	.0105	.0094	15.43
14.000	.0105	.0094	15.38
14.100	.0075	.0067	15.40
14.200	.0075	.0068	12.47
14.300	.0075	.0068	11.35
14.400	.0075	.0068	11.08
14.500	.0075	.0068	11.03
14.600	.0075	.0068	11.03
14.700	.0075	.0068	11.04

14.800	.0075	.0068	11.05
14.900	.0075	.0068	11.05
15.000	.0075	.0068	11.06
15.100	.0075	.0068	11.06
15.200	.0075	.0068	11.07
15.300	.0075	.0068	11.08
15.400	.0075	.0068	11.08
15.500	.0075	.0068	11.09
15.600	.0075	.0068	11.10
15.700	.0075	.0068	11.10
15.800	.0075	.0068	11.11
15.900	.0075	.0068	11.11
16.000	.0075	.0068	11.12
16.100	.0045	.0041	11.12
16.200	.0045	.0041	8.15
16.300	.0045	.0041	7.02
16.400	.0045	.0041	6.74
16.500	.0045	.0041	6.68
16.600	.0045	.0041	6.69
16.700	.0045	.0041	6.69
16.800	.0045	.0041	6.69
16.900	.0045	.0041	6.69
17.000	.0045	.0041	6.69
17.100	.0045	.0041	6.70
17.200	.0045	.0041	6.70
17.300	.0045	.0041	6.70
17.400	.0045	.0041	6.70
17.500	.0045	.0041	6.70
17.600	.0045	.0041	6.71
17.700	.0045	.0041	6.71
17.800	.0045	.0041	6.71
17.900	.0045	.0041	6.71
18.000	.0045	.0041	6.71
18.100	.0045	.0041	6.72
18.200	.0045	.0041	6.72
18.300	.0045	.0041	6.72
18.400	.0045	.0041	6.72
18.500	.0045	.0041	6.72
18.600	.0045	.0041	6.72
18.700	.0045	.0041	6.73
18.800	.0045	.0041	6.73
18.900	.0045	.0041	6.73
19.000	.0045	.0041	6.73
19.100	.0045	.0041	6.73
19.200	.0045	.0041	6.74
19.300	.0045	.0041	6.74
19.400	.0045	.0041	6.74
19.500	.0045	.0041	6.74
19.600	.0045	.0041	6.74
19.700	.0045	.0041	6.74
19.800	.0045	.0041	6.75
19.900	.0045	.0041	6.75
20.000	.0045	.0041	6.75
20.100	.0030	.0028	6.75
20.200	.0030	.0028	5.25

20.300	.0030	.0028	4.67
20.400	.0030	.0028	4.53
20.500	.0030	.0028	4.50
20.600	.0030	.0028	4.51
20.700	.0030	.0028	4.51
20.800	.0030	.0028	4.51
20.900	.0030	.0028	4.51
21.000	.0030	.0028	4.51
21.100	.0030	.0028	4.51
21.200	.0030	.0028	4.51
21.300	.0030	.0028	4.51
21.400	.0030	.0028	4.51
21.500	.0030	.0028	4.51
21.600	.0030	.0028	4.51
21.700	.0030	.0028	4.51
21.800	.0030	.0028	4.51
21.900	.0030	.0028	4.51
22.000	.0030	.0028	4.52
22.100	.0030	.0028	4.52
22.200	.0030	.0028	4.52
22.300	.0030	.0028	4.52
22.400	.0030	.0028	4.52
22.500	.0030	.0028	4.52
22.600	.0030	.0028	4.52
22.700	.0030	.0028	4.52
22.800	.0030	.0028	4.52
22.900	.0030	.0028	4.52
23.000	.0030	.0028	4.52
23.100	.0030	.0028	4.52
23.200	.0030	.0028	4.52
23.300	.0030	.0028	4.52
23.400	.0030	.0028	4.53
23.500	.0030	.0028	4.53
23.600	.0030	.0028	4.53
23.700	.0030	.0028	4.53
23.800	.0030	.0028	4.53
23.900	.0030	.0028	4.53
24.000	.0030	.0028	4.53
24.100	.0000	.0000	4.53
24.200	.0000	.0000	1.50
24.300	.0000	.0000	.34
24.400	.0000	.0000	.06
24.500	.0000	.0000	.00
TOTALS	2.500	1.6931	2761.68

STORM HYDROGRAPH VOLUME = 22.82 ACRE-FEET
MAXIMUN STORM DISCHARGE = 362.05 CFS

ITEX, Site Runoff (Disturbed, 160 acres), 10-yr, 24 hr Storm

STORM HYDROGRAPH RAIN = 1.600 DURATION = 24.0 RUNOFF = 1.027

STORM DISTRIBUTION IS SCS 24-HR

CURVE NUMBER METHOD CN =94.0

TIME (HOURS)	RAINFALL (INCHES)	NET RAIN (INCHES)	DISCHARGE (CFS)
23.600	.0019	.0017	2.84
23.700	.0019	.0017	2.84
23.800	.0019	.0017	2.84
23.900	.0019	.0017	2.84
24.000	.0019	.0017	2.84
24.100	.0000	.0000	2.84
24.200	.0000	.0000	.94
24.300	.0000	.0000	.22
24.400	.0000	.0000	.04
24.500	.0000	.0000	.00
TOTALS	1.600	1.0271	1675.26

STORM HYDROGRAPH VOLUME = 13.85 ACRE-FEET

MAXIMUN STORM DISCHARGE = 222.31 CFS.

Purpose: Size drainage swales to convey 100-yr, 24-hr storm

Assume:
- Swale around the perimeter of the landfill is excavated into the shale bedrock, n =
- Swale between cells
- Side slope = 2:1
- Size swale to convey runon/runoff
- Assume entire site is disturbed and contributes runoff
- Runon → A 20
  B 80 Max flow (cfs)
  C 275
  D 175
- Runoff from site = 390 cfs per 160 acres
- Use Mannings Equation to size channel

South and West Perimeter Swale

Swale runs from SE corner of Cell 3 to NW corner of Cell 2 to outfall #1

* SE corner of Cell 3 to midpoint to SW corner of Cell 2

Flow = 1/2 Area C = 138 cfs
Waste cell (30 cc) = 73 cfs
Use 210 cfs

Min slope = 1%
n = 0.03 (Flammer, 1986)
Min depth = 4'

Size channel

assume b = 2' → y = 3.4' width = 3.4(4)+2 = 15.6
b = 4' → y = 3.0' 3.0(4)+4 = 16.0

To elev 4375' use b = 3', y = 4' (max velocity = 8.3 fps)

* Midpoint (SE Cell 3 to SW Cell 2) to SW corner Cell 2

Flow = Area C = 275 cfs
Waste cell (55ac) = 135 cfs
Use 410 cfs

Min depth = 4'
n = 0.03
Min. slope = 1%

Size channel
assume b = 6' → y = 3.7'

Use: b = 6', y = 4' (min) → velocity = 8.3 fps
b = 2' y = 5' (min)
b = 0 for y ≥ 6' → velocity = 7.8 fps

If s = 0.5%, b = 3' → y = 4.9'

From elev 4375 to 4359 use b = 3' y = 5' (max velocity = 8.4 fps)

* From SW corner Cell 2 to NW corner Cell 2

Flow = Area C = 275 cfs
Waste Cell (95ac) = 232 cfs
Use 510 cfs

Min slope = 1%

assume b = 3' → y = 4.7'

(from 4340 to 4330)

From elev 4359 to 4320 use b = 3', y = 5' (max velocity = 14.4 fps)

* From NW corner of Cell 2 to Outfall 1

Flow = Area C = 275
Area B = 80
Waste cell (21.5 ac) = 524
Use flow = 880 cfs

Swale → b = 3', s = 1%, m = 2, y = 5.86'
b = 3', s = 0.5% → y = 6.8'

Use b = 3', y = 6' for slope = 1% or greater
b = 3', y = 7' (min) for 0.5% ≤ slope ≤ 1.0%

East and North Perimeter Swale

Swale runs for SE corner of cell 3 TO NE CORNER of cell 3 to NW corner of cell 3

* SE corner of cell 3 to midpoint of East side of cell 3

Flow = Area D (3/4 AREA) = 131 cfs
Waste Cell (16.7 acres) = 38 cfs
USE FLOW = 169 cfs

Min Slope = 1%
n = 0.03

Swale → b = 3', s = 1%, m = 2, y = 2.87

USE b = 3', y = 3' FROM SE CORNER cell 3 to midpoint EAST SIDE CELL 3 @ 1% min slope (Max Vel. = 8.72 fps)

* MIDPOINT EAST SIDE cell 3 to NE corner cell 3

FLOW = AREA D = 175 cfs
Waste Cell (14.5 + 15.7 acres) = 73.6 cfs

Use 249 cfs

Min slope = 1%
n = 0.03

Size channel.

Swale b = 3', y = 3.41' Vel = 7.43 fps

Use b = 3', y = 4', (max velocity = 9.62 fps)

* NE corner cell 3 TO OUTFALL

FLOW = AREA D = 175 cfs
Waste Cell (14.5 + 15.7 + 9.6 acres) = 97 cfs

Use 272 cfs

Min slope = 1%
n = 0.03

SIZE CHANNEL

Swale b = 3', y = 3.55', VEL = 7.59 fps

Use b = 3', y = 4', (MAX VELOCITY = 7.59 fps)

NORTHEAST CORNER CELL 1

Swale runs East into NE corner & North into NE corner

* North Side Cell 1 Elev 4340 → OUTFALL

FLOW = Waste Cell (3.5 acres) = 8.5 cfs

Min Slope = 1%
n = 0.03

Size channel:
Swale b = 2', y = .77' Vel = 3.12 fps
Use b = 2', y = 1' (max Vel = 3.12 fps)

* East Side Cell 1, Elev 4350 → OUTFALL NE corner

FLOW = Waste Cell (6.4 acres) = 15.6 cfs
½ Area A = 10 cfs Use 25.6 cfs

Min Slope = 1%
n = 0.03

SIZE CHANNEL

Swale b = 2', y = 1.32 ft Vel = 4.28 fps

Use b = 2', y = 2' (Max Vel. = 5.40 fps)

NORTH SIDE CELL 1 TO OUTFALL ON WEST SIDE CELL 1

Swale runs WEST ON North side Cell 1 Then South to Outfall

* Elev 4340 TO NW corner CELL 1

FLOW = Waste Cell (26.8 acres) = 65 cfs

Min Slope = 0.0% Use 65 cfs
n = 0.03

SIZE CHANNEL

Swale b = 3', y = 1.56', Vel = 6.80 fps

Use b = 3', y = 2', (Max Vel = 8.78 fps)

* NW corner Cell 1 TO outfall

FLOW = Waste Cell (26.8 + 4.8 acres) = 77 cfs
Use 77 cfs

Min Slope = 0.6%
n = 0.03

Size Channel

Swale b = 3', y = 2.25', Vel = 4.53 fps

Use b = 3', y = 3' (Max Vel = 4.55 fps)

NORTH SIDE Cell 2 TO NW CORNER CELL 2

Swale runs West from Elev 4360 Between Cell 1 & Cell 2 TO NW Corner Cell 1

* East Side Cell 1 South to SE corner Cell 1

FLOW = ½ Area A = 10 cfs
Waste Cell (2.9 acres) = 7 cfs
Use 17 cfs

Min Slope = 1%
n = 0.03

Size Channel

Swale b = 2', y = .92, V = 4.85 fps

Use b = 2', y = 1' (Max Vel = 4.85 fps)

* North side Cell 2 TO SE corner Cell 1

FLOW = Waste Cell (24.7 acres) = 160 cfs
Use 77 cfs

Min Slope = 2%
n = 0.03

Size channel

Swale b = 3', y = 1.50', Vel = 6.66 fps

Use b = 3', y = 2 (Max Vel = 6.66 fps)

* SE corner Cell 1 to NW corner Cell 2

FLOW = WASTE CELL 2 (24.7 + 31.1) = 136 cfs
Waste cell 1 (2.9ac) = 7 cfs
Area A = 10 cfs
Use 153 cfs

Min Slope = 1%
n = 0.03

SIZE CHANNEL

Swale b = 3', y = 2.75' Vel = 6.56 fps

USE b = 3', y = 3' (Max Vel = 8.50 fps)